DOCUMENT RESUME

ED 034 588

PS 002 576

AUTHOR	Berger, Barbara
TITLE	A Longitudinal Investigation of Montessori and Traditional Prekindergarten Training with Inner City Children: A Comparative Assessment of Learning Outcomes. Three Part Study.
INSTITUTION	Center for Urban Education, New York, N.Y.
PUB DATE	Sep 69
NOTE	164p.
EDRS PRICE	EDRS Price MF-$0.75 HC-$8.30
DESCRIPTORS	Classroom Techniques, Cognitive Development, *Comparative Analysis, Culturally Disadvantaged, *Educational Research, Inner City, Intervention, *Longitudinal Studies, Perceptual Development, Preschool Children, *Preschool Programs, *Program Evaluation, Teacher Evaluation, Urban Population
IDENTIFIERS	Montessori Methods

ABSTRACT

This research investigates the learning impact of Montessori prekindergarten training as compared to traditional approaches with economically deprived Puerto Rican and Negro children. The three-part, 156-page monograph includes a 22-page introduction to Parts I and II, and a 37-page appendix to Part I. Parts I and II assess training effects of the first year of schooling, focusing on children beginning prekindergarten at approximately 4 to 4 1/2 years of age. The basic research design also includes an evaluation of training for children beginning school at 3 to 3 1/2 years. Part I contains an evaluation of perceptual and cognitive abilities. Part II investigates pupil preference for cognitive styles typifying ego strength in the young child and relevant for autonomous problem-solving strategies. Part III includes a follow-up assessment conducted at the end of kindergarten in order to investigate the cumulative effects of training over a longer period of schooling. The appendix to Part I contains age, sex, and ethnicity trends for the population investigated, a 25-page description of the test battery, a sample teaching log monthly checklist, and a list of sample questions for teacher interviews. The monograph also includes a list of 54 references used for Parts I, II, and III. (JF)

U. S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

CENTER FOR URBAN EDUCATION
105 Madison Avenue
New York, New York 10016

ED034588

A LONGITUDINAL INVESTIGATION OF MONTESSORI AND TRADITIONAL PREKINDERGARTEN TRAINING WITH INNER CITY CHILDREN: A COMPARATIVE ASSESSMENT OF LEARNING OUTCOMES

- Three Part Study -

Barbara Berger, PhD

Curriculum Development Committee

September 1969

PS002576

PARTS I & II - A COMPARISON OF TRAINING EFFECTS AT THE END OF ONE YEAR OF KINDERGARTEN

PART I: An Assessment of Perceptual and Cognitive Skills

PART II: An Assessment of Cognitive Style Patterning

PART III - A FOLLOW-UP STUDY OF TRAINING EFFECTS AT THE END OF KINDERGARTEN

TABLE OF CONTENTS

Page

INTRODUCTION TO PARTS I AND II 1

The Problem
Research Design
Teacher-Classroom Profiles

PART I - AN ASSESSMENT OF PERCEPTUAL AND COGNITIVE SKILLS. . . 15

Introduction
Results of the Public School Investigation
Results of the Community Center Investigation
A Summary of Training Effects

PART II - AN ASSESSMENT OF COGNITIVE STYLE PATTERNING. 62

Introduction
Results of the Public School Investigation
Results of the Community Center Investigation
A Summary of Training Effects

PART III - A FOLLOW-UP STUDY OF TRAINING EFFECTS AT THE END OF KINDERGARTEN 95

The Research Problem and Design
Classroom Profiles
Results of the Assessment
Summary

APPENDIX TO PART I 115

REFERENCES FOR PARTS I, II, AND III. 152

INTRODUCTION TO PARTS I AND II

Chapter Page

1 THE PROBLEM. 1

Basic Underlying Assumptions. 2

Key Questions to Which the Research is Addressed. . 2

Review of the Literature. 3

2 RESEARCH DESIGN. 6

The Basic Research Plan 6

The Sample. 7

Methods 8

3 TEACHER-CLASSROOM PROFILES 12

The Experimental and Control Teachers in the Public School Study 12

The Experimental and Control Teachers in the Community Center Study. 17

CHAPTER 1

THE PROBLEM

This research aimed to investigate the learning impact of Montessori prekindergarten training as compared to "traditional" approaches with Puerto Rican and Negro children from economically deprived backgrounds.

Specifically this investigation sought to assess training effects of the first year of schooling from two evaluation perspectives:

1. Perceptual and Cognitive Skills. This phase included an evaluation of perceptual skills (visual discrimination-analytic ability and visual-motor integration capacity); and a range of cognitive abilities including memory, discrimination learning, problem solving, knowledge and utilization of concepts, and general information and comprehension.
2. Cognitive Style Patterning. This phase investigated pupil preference for cognitive styles typifying ego strength in the young child and relevant for autonomous problem-solving strategies. It involved the assessment of such variables as curiosity and exploratory tendencies, field independence, innovative behavior, motor impulse control, reflectivity, task persistence.

Thus the scope of this research included a systematic comparison of training effects on differing behavioral levels: 1. mastery of specific abilities relevant for subsequent academic achievement; 2. basic ego styles relevant for self-regulatory, autonomous functioning (highly desirable educational goals which are apt to be neglected or discouraged in the formal schooling process).

The investigation focused on children beginning prekindergarten at approximately four to four and a half years of age. In addition, the basic research design included an evaluation of training outcomes for children beginning training at an earlier age stage, between three and three and a half years.

Basic Underlying Assumptions

1. Educational intervention at the prekindergarten level can significantly upgrade the cognitive development of the disadvantaged child.

2. The extent and quality of the learning impact will be contingent upon the particular character of the intervention, i.e., the resultant learning press.

3. Montessori and "traditional" training approaches typify substantially different intervention models, notwithstanding considerable variability in classroom implementation of these methods.

4. The effects of training should be apparent after seven or eight months of schooling, though less clear-cut than would be expected following an extended training period of several years.

Key Questions to Which the Research Was Addressed

The investigation was concerned primarily with clarification of the following questions:

Is Montessori training more effective than conventional approaches in upgrading visual perceptual skills?

Are these two teaching approaches clearly differentiable in terms of cognitive abilities?

Do they demonstrate a differential training impact in terms of cognitive style patterning?

To what extent are training effects comparable or different for children beginning training at earlier and later age stages?

Secondarily, the research attempted to identify any clear-cut sex, ethnicity, and age trends for the population studied.

Review of the Literature

The recent literature contains a good deal of research on learning outcomes of prekindergarten training with disadvantaged children. These investigations of schooling effects consist mainly of: 1. comparative studies of children with and without prekindergarten experiences; and 2. pre- and postevaluation studies of children in Headstart programs, looking at gains made during the school year. The research focus of some of the major investigators (Beller-R4, Hess-R28, Wolff-R53, Goldstein-R23, 24)* has been largely on cognitive learning impact with emphasis on IQ measurement, social adjustment to school, and educational readiness.

A third research model includes studies of the effects of special enrichment and experimental programs, such as the reports issued by the Institute for Developmental Studies. These investigations concur in repeatedly citing the advantages of intervention, though differing about specific gains reported, as might be expected in view of the differences in measuring devices employed.

---

*References are arranged in alphabetical order and are listed at the end of Part III.

However, the scope of this research includes relatively little by way of comparative studies of differing intervention approaches. Such comparative studies are needed to establish clear-cut guidelines for program development and improvement at the prekindergarten level. There is, in this connection, a paucity of research on Montessori training. Such research could contribute to a more precise determination of the advantages of this intervention model as compared with alternative models. The present investigation represents an effort to fill this gap.

Of the few Montessori studies known to this investigator, two included comparisons of Montessori and non-Montessori trained children, with both investigators (Fleege-R15 and Sister Josephina-R33) reporting positive values for this instructional approach. Fleege cited advantages chiefly in terms ofgreater maturity and readiness for school learning, sensory acuity and a number of behavior traits (independence, self-control, concentration, self-confidence); however, here the assessment was based largely on teacher rating scales. (In contrast, experimental measurements were employed in this investigation.) The second investigator (Sister Josephina) reported greater mean gains for the Montessori children in haptic perception.

Other investigators, looking at the Montessori impact (Banta-R1, Kohlberg-R37), have been primarily concerned with learning effects in relation to social class. Kohlberg's study focused chiefly on pre-post IQ gains for the first year of training, and reported a substantial increase for both middle and lower class children, but notably, the latter. Banta's research included an evaluation of Montessori training, which examined cognitive style in relation to classroom learning climate as well as social class. His findings paralleled Kohlberg's in demonstrating differential cognitive outcomes for lower and middle class children; they also showed a significant interaction between Montessori training impact and classroom learning climate, indicating that Montessori environments vary a good deal from one classroom to the next. Neither of these researchers, however, undertook a systematic comparison of Montessori and alternative training approaches.

Another related area of research deals with teaching style and cognitive learning effects in young children. A major research effort in this connection (the Hess and Shipway-R29 investigation of maternal teaching style) showed a highly positive relationship between the instructional style of mothers in an experimental teaching situation and resultant learning outcomes.

The results of these various investigations show favorable schooling effects for both Montessori and conventional training efforts. But the literature includes very few comparative studies of children instructed by these different approaches. Such data as is available is regrettably fragmented, since the studies undertaken to date employ differing evaluation perspectives as well as measuring devices. None includes an assessment of pupil outcomes relating to cognitive style patterning as well as perceptual and cognitive skills. This investigation represents a departure from earlier studies in this direction, as well as an extension of the efforts of previous investigators seeking to clarify the educational impact of Montessori teaching.

PS 002576

CHAPTER 2

RESEARCH DESIGN

The Basic Research Plan

The research design involved comparison studies of children trained by Montessori and "traditional" prekindergarten approaches, the latter serving as the controls for the experimental (Montessori) subjects. No "pure control" groups (children receiving no training) were included. Assignment of subjects to experimental and control classes was based chiefly on considerations of class comparability relative to sex and ethnic composition. As far as possible, children were randomly assigned.

The scope of this research included two discrete investigations of children taught by experimental and conventional approaches -- one conducted in a public school in the Bronx, and the other in a neighboring, church-affiliated, community center. The community center setting included two half-time Montessori teachers (one running a morning session, and the other an afternoon session) and one full-time control teacher, teaching a morning and an afternoon class. The public school setting involved one full-time Montessori teacher and one full-time control teacher, each teaching a morning and an afternoon session. In each instance, experimental and control classrooms were comparably staffed with teacher aides, and both had the services of family case workers.

An important feature of this research design was the replication angle involved in carrying out two independent comparison studies, where the major parameters of the samples were roughly equivalent, and experimental procedures as well as methods of data analysis were the same. The second investigation, the community center study, also had replication built into it by way of including two experimental groups taught by different Montessori teachers, and two age groups. Thus the design of this study provided internal replication on two levels: by teachers as well as by age.

The Sample[1]

The combined sample for the two studies consisted of 93 children, including Puerto Rican and Negro youngsters of both sexes, enrolled in Headstart project classes from the fall of 1966 to the summer of 1967. Approximately one half of the public school children were on welfare, as were two-thirds of the community center population.

The public school population comprised a homogeneous age range, consisting of children entering the prekindergarten at approximately four years of age (between 3.8 and 4.6 years). The community center population consisted of a mixed age range, including children of the same age as the public school sample, as well as younger age entrants beginning school at approximately three years of age (3 to 3.6 years).

All subjects were administered the revised Stanford-Binet (Form L-M) at the beginning of the school year, four to six weeks after classes began. This intervening interval was intended to control for any initial, temporary depressant effect and a resultant performance decrement, which would produce a misleading picture of intellectual functioning.[2] Statistical comparisons of mean IQ scores for experimentals and controls indicated no significant differences for the two groups in either the public school or community center samples.

---

[1] Complete sample descriptions for each phase of the assessment are included in Parts I and II of this report.

Methods

Treatment Procedures. Experimental and control treatments consisted of approximately eight months of schooling in Montessori and "traditional" prekindergarten classes. No special training innovations were introduced by the researcher. Teachers were informed of the general purpose of the project, and the assessment focus on perceptual and cognitive skills development. They were instructed to implement their respective curriculums to the best of their ability. (Control teachers used the New York City prekindergarten curriculum as their guide and Montessori teachers followed the prescribed Montessori curriculum.) All teachers conferred individually with the investigator from time to time, and also met periodically, as a group, to discuss matters of general concern (handling of problem youngsters, strategies of working with these kinds of children and their special needs, and useful classroom resource materials.) These meetings further served to provide the investigator with feedback.

---

[2] All of the Puerto Rican children were tested in Spanish by a Puerto Rican female examiner to offset language handicap. Negro children were tested by two examiners, one Negro female and one white male, each testing an equivalent proportion of experimentals and controls, and boys and girls.

Since two of the Montessori instructors had just completed their internships, classroom observation and supervision by a Montessori consultant were provided for several months to help insure sound teaching practices. All three Montessori teachers also attended an inservice training seminar, where a Montessori training specialist demonstrated instructional procedures for presenting didactic materials.

Classroom Evaluation Procedures. Because a precise specification of treatments is crucial in any comparative study of teaching methods, procedures were implemented to determine what actually went on in each of the classrooms investigated. These consisted chiefly of:

1. A series of independent classroom observations, conducted by the investigator and research assistant, focusing on differing aspects of classroom process and teacher behavior. In the case of the Montessori classes, additional observations were made by the Montessori consultant on this project, and a standard supervisory evaluation was conducted by an American Montessori Society training supervisor.

2. Monthly teaching logs submitted periodically by teachers, requiring day by day specification of the content and focus of formal instruction, pupil learning objectives, and techniques of implementation. (See Appendix to Part I).

Supplementary procedures included a structured classroom observation instrument to assess gross characteristics of teaching style,[3] and interviews with teachers to clarify their professional stance regarding priority of learning goals, and to obtain self-reports. (See Appendix to Part I).

---

[3] This research instrument was developed by Dr. Helen Robison and colleagues at Teachers College, Columbia University, specifically for prekindergarten teachers.

Assessment Procedures. All subjects were individually tested during the last month of school. The cognitive style measurements were given first in one testing session, and the perceptual-cognitive skills battery given subsequently in three sessions. This ordering of testing procedures was designed to control for possible learning effects accruing from the perceptual/conceptual assessment experience which might influence performance on the cognitive style battery. (We were interested in the child's spontaneous, untrained approach to problem solving situations.)

The measurements of cognitive patterning were administered by two female examiners. The perceptual/conceptual battery was administered by different examiners, two male and one female. The allocation of subjects to examiners was balanced with respect to the proportions of experimentals and controls, boys and girls, and Negroes and Puerto Ricans tested. All examiners visited classrooms prior to testing in order to become acquanited with the children.

Data Analysis Procedures. In the public school study involving one Montessori and one control teacher, each teaching a morning and an afternoon session, experimental and control comparisons were based on a pooling of a.m. and p.m. classes for both teachers.

In the community center, which included two Montessori teachers, each teaching a half-day session, and a control teacher running morning and afternoon sessions, the procedure was as follows: separate experimental and control comparisons were made for each Montessori group, pooling the control a.m. and p.m. classes. These comparisons included an age breakdown for younger and older children.

The phi test was used in all of these group comparisons because it is a short-cut statistical procedure, and a sensitive index of the extent of relationship, particularly appropriate for small samples comparable to the small N's in the community center Montessori samples. Probability figures were obtained by converting the phi scores to t scores by means of the formula, $t = \frac{\phi}{SE\ \phi}$.

CHAPTER 3

TEACHER-CLASSROOM PROFILES

The Experimental and Control Teachers in the Public School Study

These two teachers were experienced primary grade teachers, although relatively less experienced at the prekindergarten level. The control teacher was one of the regular kindergarten teachers in this school. The Montessori teacher was a newcomer to the school and a beginner in Montessori instruction, although very well trained. This teacher had a diploma from the Association Montessori International, and was trained at the Maria Montessori Teacher Training Institute in England.

The Montessori Classroom. What was impressive in this classroom was: the orderliness and the quiet work-oriented atmosphere. The starkness of the room was emphasized by an absence of the usual decorations, pictures, charts. (This teacher was attempting to reduce environmental distractions initially, by eliminating all nontask relevant stimuli, in order to facilitate concentration and involvement with Montessori materials.) Another feature of the prepared environment was a narrow range of activity choices. These were confined chiefly to the didactic Montessori equipment, reflecting this teacher's effort to concentrate on sensorial training and stimulate interest in this direction.

Basically, this learning press represented a highly structured and organized teaching approach to content and procedures. The various pieces of equipment were introduced gradually and sequentially, with the teacher establishing precise procedures for their handling and use. Only a few materials were introduced at a time, and children were required to demonstrate their mastery of very explicit task routines before additional materials were presented. Instructional techniques consisted of firm and exacting guidance in sensorial training exercises, with rigorous adherence to prescribed sequences of instruction. This teacher's highly methodical approach, although commendable for the clarity of presentation and systematic follow-up, was apt to be inflexible at times. She was rated excellent regarding mastery of training techniques and thoroughness of instructional approach by the Montessori consultant on this project and the national Montessori training supervisor. But their feedback and our observation noted that her faithfulness to the prescribed sequence for various training tasks was at times unsuited to the child's natural pace -- frequently slowing down the learner unnecessarily, with some resultant diminution of pupil interest and involvement.

Other distinctive features of this Montessori environment were: clear-cut teacher expectations and demands for self-application and self-control; consistent reinforcement of an attentive, precise and careful task orientation; and insistence on completion of tasks begun. All of these factors contributed to a fairly rigorous achievement press, making for some reduction of pupil spontaneity as well as impulsivity. The learning climate also sparked a certain amount of pupil stress and competitiveness as a consequence of this teacher's sometimes harsh disciplinary techniques, which were apt to produce hurt feelings and occasional tears.

On the whole, this milieu typified a high degree of teacher directiveness and control (much more so than the Montessori environments in the community center). It was heavily work-oriented, providing very limited outlets for playfulness or self-expression on an imaginative, fantasy level. Teacher behavior showed a highly consistent pattern of positive and negative reinforcements, firmly encouraging independence and self-direction, and contributing to the development of group cohesiveness. (Again, this occurred to a greater extent here than in the community center Montessori classrooms.)

The Control Classroom. This classroom was quite typical of conventional prekindergartens in terms of equipment, daily routines, and educational practices. The atmosphere, in contrast to the Montessori milieu, was noisier, livelier, more informal, and overall, seemed more relaxed. This climate was also considerably more sociable and interpersonally oriented. There was for example, more spontaneous peer group interaction and pairing (largely due to physical arrangements which permitted six or seven children to work individually at a table, as well as the availability of a dollhouse corner and large building blocks). Sociability was further evident with respect to children's spontaneity in approaching visitors or observers to show their work, relate an event or merely converse with the expectation of adult interest and approval. This behavior was not observed in the experimental group, where children ignored visitors and attended to the learning activities in which they were engaged, in line with the stronger task orientation of the Montessori teacher.

Another difference between the two classrooms related to the proportion of the teacher's time spent in instructional activity as compared with nonteaching activities. Teacher comparisons based on the structured observation instrument indicated that the control teacher spent more time doing housekeeping routines and conversing with other adults (teacher aides, messengers, another classroom teacher) while the Montessori teacher spent more time instructing and dealing with pupil behavior. These differences were highly significant, attaining the .004 level. In fact, the structured observation data showed that this control teacher engaged in less teaching and more nonteaching activity than any of the other teachers. She provided very loose supervision during the free play period, although from time to time she would assist a child, suggest an activity, or initiate a brief social exchange.

A further distinction between the two classrooms pertained to the specific instructional techniques preferred. The control teacher showed a more extensive use of verbal techniques and the Montessori teacher displayed a greater preference for collaborative teaching procedures (activities in which teacher and child participate together). In this respect, the structured observation data also discriminated at a highly significant level, p. of .006. And there was too, a difference in the quality of the teacher-child transactions in the instructional process. By and large, the control teacher tended to be more encouraging of pupil spontaneity and divergent responses.

With respect to curriculum emphasis, the control teacher did less specific perceptual training and considerably more language training activities. (This difference was clearly apparent in comparisons of the of the teaching logs.) She tended to focus on concept and vocabulary development and practice in communicating ideas, largely through guided group discussion; and regularly worked for auditory awareness and sensitivity through songs and rhythmic activities. There was greater stimulation of pupil verbalization as a result of the control teacher's talking more to the children informally; and a repetitive reinforcement of auditory attention by her verbal guidance style. Moreover, the program content in the control classroom included a heavier emphasis on creative art work, a special interest of this teacher.

In sum, the control environment typified a relatively permissive and loosely organized learning climate, where the structure of teacher guidance afforded more pupil leeway than the Montessori setting in terms of the limits set. While there were definite ground rules in the control classroom, they were maintained with less consistency; and pupil compliance seemed to be largely regulated by what the traffic would bear on a given day (the teacher's manner and reactions providing the necessary cues for the group). Expectations and demands relative to pupil accomplishment were not as pressing or specific, and the achievement press, therefore, more casual and relaxed. The manner in which this teacher related to the children suggested somewhat higher tolerance for dependency behavior as well. Overall, the classroom press connoted a more playful and less work oriented tone; was more stimulating of creative self-expression and fantasy play; and involved more focused teacher effort to develop favorable self-concept.

The Experimental and Control Teachers in the Community Center Study

The control and the Montessori I teachers were experienced prekindergarten teachers. However, the Montessori II instructor had no prior classroom experience beyond the Montessori internship. Both Montessori teachers came to this project with American Montessori Society certification, although the training experience of the Montessori I teacher was more solid and substantial.

The Montessori Teachers. These two teachers shared the same classroom for their half-day sessions. Thus the physical environment was equipvalent for the two experimental groups. This setting was indeed very different from the public school Montessori classroom in that the prepared environment offered a wide range of activity choices; many non-Montessori training materials were available as well as the standard Montessori equipment. In contrast to the restrictive range of stimuli in the Montessori public school class, the variety here was, if anything, excessive. This feature was consistent with the conviction of these Montessori teachers that the children should not be confined to the Montessori training materials, since their natural interests and inclinations demanded more variety. The initial wide choice offered pupils meant that these children were less active with the sensorial training materials and did not get as concentrated a dose of these training activities. (Later in the year this aspect was altered, and the diversity of stimuli available at any given time was reduced.)

Basically, the two Montessori teachers at the community center were similar in classroom philosophy and practice. Unlike the public school

Montessori teacher, they typified a much looser implementation of training procedures and practices. On the whole, their style reflected less insistence on correct procedures in handling and using Montessori equipment. In making presentations, they were not as methodical and precise in applying prescribed instructional sequences, nor as systematic with respect to followup. In these respects, training procedures showed some dilution. However, they were less mechanistic and tended to sustain pupil involvement more consistently. From the standpoint of program content and emphasis, these learning environments represented a less focused concentration on sensorial training, and a more dynamic oral language training thrust; there were more varied language learning activities and group instruction involved greater verbal interplay between teachers and children.

By comparison with the public school Montessori environment, these classroom climates afforded more leeway for spontaneous unstructured exploration of the environment and a less sharply focused instructional effort with the Montessori materials. The learning press was more informal and permissive in these respects; and on the whole, connoted a more lively interpersonal atmosphere. These differences were consistent with the professional values of these teachers, who were primarily concerned with making the training experience pleasurable for the children, and secondarily with achievement qua achievement. In line with this classroom orientation, the task set was more easy going, with moderated demands for accomplishment as well as self-reliance and independence.

The two Montessori environments thus shared a common orientation which set them apart from the public school Montessori class. This is not to say that there were no teacher differences between the two community center Montessori teachers. Although their basic approach was similar, they nevertheless demonstrated differing degrees of skill relative to utilization of the training materials and mastery of the prescribed didactic techniques, as well as differences in classroom management. The experienced Montessori I teacher demonstrated greater technical competence and a firmer more directive management style. She showed more consistent ability to implement the flavor of Montessori guidance in her instructional transactions with pupils than the novice Montessori II instructor.

The Control Teacher. In a number of respects this classroom was atypical of the usual prekindergarten. For one, the physical environment did not include the conventional dollhouse corner and dress-up clothes, thereby delimiting opportunity for fantasy play and accentuating realistic type activities, chiefly cognitive. This departure from the traditional model was in line with this teacher's preference for structuring the environment to insure minimal distraction from involvement with academically oriented training materials. Her desire for pupils to show up favorably in comparison with the Montessori trained children predisposed her to be much more concerned with promoting academic skills than the average traditional teacher. This motivation further contributed to a very determined and systematic instructional effort on her part, involving daily structured perceptual or linguistic training activities. Her classroom set in this respect differed markedly from the public school control teacher's and most closely resembled the professional stance of the public school Montessori teacher.

Another distinctive feature of this classroom scene related to the pattern of child involvement with the training materials during free play. While the level of involvement was high, the focus of involvement differed notably from the other classrooms. Children tended to use the academic materials chiefly as an outlet for their imagination and a vehicle for peer sociability, approaching them less in the manner of learning tasks. In lieu of conventional handling, they preferred to devise imaginative games with these materials. This innovative behavior pattern seemed to reflect intrinsic needs for self-expression and creative play activity, developing spontaneously as a result of the teacher's hands off policy during this interval. Actually, she did very little to develop any kind of work set during free play beyond requiring the class to keep busy, and not to be disruptive while she worked with a few children. Beyond these demands few limits were set. By comparison with the Montessori teachers in this setting, this teacher did significantly less in attempting to control children's behavior. Teacher differences with respect to this variable were significant at the .001 level on the structured observation instrument.

This environment also represented a departure from the usual conventional classroom in terms of the predominance of activities involving teacher-child collaboration. Collaborative activity was significantly more characteristic for this control teacher than it was for the control teacher in the public school, with differences between them on the structured observation instrument attaining the .08 level.

The learning press also differed from most traditional classrooms in terms of the greater amount of formal teaching. This teacher spent a significantly greater proportion of her time instructing the children than the public school control teacher; and significantly less time in nonteaching activities (housekeeping, talking to other adults). On the structured observation instrument this behavior variable in fact discriminated at the .04 level. The daily routine here by contrast, included some small group structured teaching activity (usually visual matching games or language lotto) during free play period, with the teacher designating the participants, in addition to the large group structured activity, conducted by each control teacher.

The quality of teacher-child transactions in these formal instructional contexts was strikingly different from the interactions occurring in the nonteaching role (i.e., when the teacher was loosely supervising free play). Whereas in the latter situation she related to the children in a warm, supportive and nondirective fashion -- her formal teaching style was extremely authoritative, strict, and very task-oriented. Her inquiries were directed toward getting the specific answers she wanted, and divergent responses were scarcely tolerated. For example, during one of the large group teaching sessions, one of the children began to chant the alphabet, with several others joining in. This behavior was perceived by the teacher as an interruption and was promptly squelched. The learning climate was especially severe for the less able learners, because of this teacher's response to pupil failure in the teaching situation. Typically, she simply ignored the child who could not produce the right answer and proceeded to interrogate another -- a pattern spelling rejection to the failing child.

In sum, the psychological press here was less consistent than any of the other classroom environments. On the one hand, it involved an exposure to a highly permissive, basically laissez-faire, free play situation where children could interact with the training materials in idiosyncratic fashion. On the other hand, it required adaptation to an overly controlled teaching format, where the instructional transactions were extremely demanding and imposed rigid constraints on pupil spontaneity.

The contrast between the public school and community center Montessori models was quite in keeping with the rigorous and exacting professional orientation of the European trained public school Montessori teacher and the modified American training background of the community center Montessori instructors. In the case of the two control teachers, both graduates of conventional early childhood training programs, differences in classroom practices were largely attributable to personality factors and resultant differences in teaching style. Bearing in mind the classroom press differences specified within each treatment approach, it is obvious that the research design involved only partial replication; and that outcomes must be considered in relation to the particular prototypes of Montessori and conventional teaching investigated.

PART I ASSESSMENT OF PERCEPTUAL AND COGNITIVE SKILLS

Chapter | Page

4 INTRODUCTION 23

Instrumentation and Administration Procedures . . . 23

Methods of Data Analysis. 26

5 RESULTS OF THE PUBLIC SCHOOL INVESTIGATION 28

Results of the Global Analysis. 28

Findings Based on Detailed Analysis of Data 30

6 RESULTS OF THE COMMUNITY CENTER INVESTIGATION. 34

Five Year Olds -- Results of the Global Analysis. . 35

Five Year Olds -- Detailed Analysis of Data 37

Research Findings for Four Year Olds. 42

The Overall Picture of Training Effects for Younger and Older Children. 46

7 A SUMMARY OF TRAINING EFFECTS. 49

An Overview of the Two Investigations 49

A Summation of Training Trends and Their Educational Implications. 55

APPENDIX TO PART I

Section A 115

Section B 123

Section C 148

Section D 150

CHAPTER 4

INTRODUCTION

This stage of the assessment, largely exploratory, also involved the testing of the following hypothesis:

> Montessori trained children will be characterized by superior perceptual performance as compared with children trained by conventional methods.

Instrumentation and Administration Procedures

The instrumentation employed here consisted of a series of measurements selected from a more comprehensive prekindergarten battery, scaled down to the two and a half year level; items selected being the more difficult ones appropriate to the age of our sample.[1] All these measurements utilized concrete, manipulable stimulus materials, except two which employed verbal stimuli and required verbal responses (General Information and Knowledge of Relational Concepts). They defined a progression of challenge and complexity in the ordering of specific tasks included for each measure.

The modified battery (see Appendix to Part I for elaboration and precise sequence of presentation) consisted of the following seven assessment measures:

---

[1] The original battery was developed and piloted in 1967 by Dr. William O. Jenkins and Miss Barbara Frengel, in conjunction with a behavorial assessment project sponsored by the Center for Urban Education.

Perceptual Area Subtests

Perceptual Discrimination. This measure tapped chiefly visual analytic and visual-motor integration skills. Specific tasks here included:

1. Formboard
2. Mannikin
3. Bear Puzzle
4. Block Designs

Conceptual Area Subtests

Delayed Memory. This measure indexed retention capacity with intervening time delays. Specific tasks included:

1. Two minute delay
2. Four minute delay
3. Eight minute delay

Immediate Memory. This memory test assessed immediate recognition, recall and memory for patterns, and included:

1. Object recognition
2. Object recall
3. Memory for bead designs

Discrimination Learning. This subtest measured concept learning ability relative to acquisition of simple and more complex discriminatory responses. It also provided a measure of learning flexibility in its inclusion of the Extra-dimensional Shift problem, where solution demanded ability to shift perceptual learning set. It consisted of the following tasks:

1. Simple discrimination

2. Complex discrimination
3. Extra-dimensional shift

Problem-solving. This subtest also measured concept learning ability, but with respect to acquisition of complex positional concepts involving single and double alternation patterns. The model for this measure was the Jenkins-Pascale Test of Concept Formation, which demonstrates discriminatory power up and down the phylogenetic hierarchy. Consequently, this subtest is regarded as the best single indicator of learning efficiency. It consisted of two tasks:

1. Single alternation
2. Double alternation

General Information and Comprehension. The items here were based on comparable sections of the Wechsler Intelligence Scale for Children.

Knowledge of Relational Concepts. This subtest assessed child's grasp of basic concepts (size, length, directionality, quantity, weight) on two levels: 1. recognition of a positive instance of the concept; 2. ability to produce/demonstrate the concept without benefit of examiner or stimulus cues.

As might well be expected, performance in these behavior areas correlated moderately with intelligence test performance. Subtest correlations with Stanford-Binet IQ scores for our sample ranged from .37 to .67, with the exception of the two measures tapping basic learning ability: Discrimination Learning and the Single and Double Alternation Problem-Solving. These subtests in fact showed a near zero correlation with the Stanford-Binet, indicating that they are indeed tapping a different kind of ability than is indexed by the conventional intelligence test, and affirming validity insofar as the latter does not specifically tap basic learning capacity.

This battery was administered individually in three testing sessions, the first two lasting approximately one hour, and the final session about a half hour. Two of the measurements were considered to be especially taxing by way of the attention and concentration required -- Delayed Reaction and the Single and Double Alternation Problem Solving test. This factor was taken into consideration in the sequencing of these two measures. In order to control for possible depression of performance due to fatigue effects, the memory test was introduced at the beginning of the initial testing session and the problem solving test was administered solo in the final session (following completion of the rest of the battery in the two preceding sessions).

Methods of Data Analysis

Specific techniques of handling the data in this stage of the assessment consisted of both global (gross) methods of analysis as well as more detailed analytic procedures.

Global Methods of Analysis.

The purpose here was to determine whether experimentals and controls differed significantly in terms of overall achievement levels. The technique was to compare the two treatment groups with respect to mean total scores on the various subtests.

More Detailed, Specific Methods of Analysis.

This stage involved a comprehensive test pattern analysis of mean group scores on specific tasks within each subtest, as well as total subtest scores. Procedures included experimental and control comparisons for the high and low achievers on the various subtests (top and bottom ten cases) as well as for the total training group. Group comparisons also included an analysis of the pattern of mean score differences on this test battery to uncover any significant directional trends favoring experimentals or controls.

CHAPTER 5

RESULTS OF THE PUBLIC SCHOOL INVESTIGATION

The sample for this study consisted of 57 subjects, entering school at approximately four years of age. It represented a fairly even split regarding proportions of experimentals and controls, boys and girls and Negroes and Puerto Ricans. Detailed sample information is provided in Table 1; the age data specified refers to the age of subjects at the time of the June assessment, when they were approximately five years old.

TABLE 1

SAMPLE CHARACTERISTICS

	Montessori	Control
Age Range	(4-6)-(5-5)	(4-6)-(5-5)
Mean Age	5.0	4.8
IQ Range	54-116	63-110
Mean IQ	82.9	84.1
Boys	12	15
Girls	17	13
Puerto Ricans	17	12
Negroes	12	16
Total N	29	28

Results of the Global Analysis

As to mean achievement levels on this battery, (Table 2) the picture is one of little gross differentiation for the two treatment groups. Experimental and control comparisons of total subtest scores on the various assessment measures yielded only small and insignificant differences, with none of the probabilities attaining the twenty percent level of confidence.

TABLE 2

MEAN ACHIEVEMENT LEVELS FOR EXPERIMENTALS AND CONTROLS[a]

Area	Montessori	Control	Significance Level
	N=29	N=28	
Perceptual Discrimination			
Mean	13.9	13.4	
Median	15.0	13.0	>.20
Range	2-22	2-24	
Delayed Memory			
Mean	9.6	9.8	
Median	14.0	13.5	>.20
Range	2-14	2-14	
Immediate Memory			
Mean	9.2	9.6	
Median	10.0	9.5	>.20
Range	0-17	0-16	
Discrimination Learning[b]			
Mean	33.3	34.8	
Median	39.0	28.0	>.20
Range	1-72	1-72	
Problem Solving[b]			
Mean	57.9	52.7	
Median	96.0	59.0	>.20
Range	5-96	2-96	
General Information			
Mean	15.1	20.5	
Median	16.0	20.0	>.20
Range	0-43	0-31	
Relational Concepts			
Mean	19.5	20.6	
Median	21.0	22.0	>.20
Range	0-30	0-31	

---

[a] Data in this table are based solely on total subtest scores and do not take into account scores on specific tasks.

[b] Superior performance on Discrimination Learning and Problem Solving (Single and Double Alternation) is indexed by the lower rather than the higher score.

While the magnitude of these differences was insignificant, the pattern of score differences did show a clearcut directional trend favoring the controls, on all of the conceptual measures. This trend was significant at the .06 level, although greatly diluted by the fact that the medians split about 50-50 for the two groups (but were higher for the experimentals on Perceptual Discrimination and the two memory measures). Montessori, however, was clearly in the lead on the Perceptual Discrimination test, where both the mean and median showed a higher achievement level for the experimentals.

Further comparisons based on the comprehensive test pattern analyses, which follow this presentation, substantiated these directional trends, also consistently discriminating between the two treatment approaches in the same directions.

Findings Based on Detailed Analysis of Data

Perceptual Trends. Significant differences favoring the Montessori approach and supporting the hypothesis emerged in the comprehensive test pattern analysis on the Perceptual Discrimination measure (Table 3). These differences discriminated for the poorest achievers (bottom ten cases, B-level analysis). Here mean score differences between experimentals and controls indicated the Montessori trained children performed at a significantly higher level on the more difficult perceptual tasks (p. of .04 on the Bear Puzzle and p. of .05 on Block Designs) and obtained a higher total score (p. of .09 on total subtest score). It is also apparent in this table that a positive but reduced experimental effect obtained for the total training group (representing varying levels of ability). Here the directional pattern of mean score differences favored Montessori too, but none were significant.

TABLE 3

COMPREHENSIVE TEST PATTERNS FOR EXPERIMENTALS AND CONTROLS ON PERCEPTUAL DISCRIMINATION

	Mean Group Scores		Results		B Level Analysis	
Test	Montessori	Control	Direct.	Sign.	Bottom 10	Top 10
Formboard	2.00	2.00	C = M	--		
Manikin	3.14	3.29	C>M	--		
Bear Puzzle	2.62	2.25	M>C	--	M>C (p=.04)	
Block Design	6.17	5.82	M>C	--	M>C (p=.05)	
Total Score	13.93	13.36	M>C	--	M>C (p=.09)	

In addition to the achievement scores represented in Table 3, time scores were computed for these perceptual tasks (except for Block Designs which was not timed). Comparisons of the speed of performance also discriminated significantly in favor of Montessori on the most difficult of these tasks (Bear Puzzle), for the superior perceptual achievers (top ten cases). However, comparisons of speed of performance for the total training groups favored the controls. Although differences were not significant here, the directional pattern of mean score differences showed a tendency for the Montessori pupils to work more slowly on the average -- a finding which was expected as a result of this Montessori teacher's consistent reinforcement of a careful and precise task orientation.

These perceptual learning effects demonstrated the benefits of Montessori training to be salient for the poor perceptual achievers, but modest for the average and above average perceptual achievers (a finding also replicated in the succeeding investigation). Thus results specified Montessori perceptual training procedures as particularly effective with children functioning poorly on a perceptual level (an outcome quite consistent with the historical development of this method as an instructional system for handicapped learners), and superior to conventional teaching strategies for these children. Insofar as the advantage of Montessori training was less clear-cut for the perceptually proficient youngsters, we can expect more comparable pupil outcomes from Montessori and conventional teaching for this learner group.

Conceptual Trends. The comprehensive test patterns on the conceptual part of the battery (Table 4) showed some significant differences on three measures -- Immediate Memory, Discrimination Learning, and Problem Solving -- with all of these differences favoring the controls. These performance differentials, however, discriminated solely at the extremes of the ability range. Two of the Memory tasks and one of the Discrimination Learning tasks discriminated for the poorest learners (bottom ten cases) with probabilities of .036 and .09 respectively, while the Problem Solving task discriminated for the high achievers (top ten cases) at the .04 level. Although none of the performance differentials obtaining for the total training groups were significant, the directional pattern of mean score differences across ability levels also favored the controls on 14/18 task comparisons -- a trend which is significant at the .01 level (binomial probability).

TABLE 4

COMPREHENSIVE TEST PATTERNS FOR EXPERIMENTALS
AND CONTROLS ON THE CONCEPTUAL MEASURES

	Mean Group Scores		Results		B Level Analysis	
Test	Mont.	Cont.	Direct.	Sign.	Bottom 10	Top 10
Delayed Memory						
Immed. Recog. (no delay)	1.97	1.93	M>C	--		
4 Minute	2.90	2.93	C>M	--		
8 Minute	4.70	4.90	C>M	--		
Total	9.57	9.76	C>M	--		
Immed. Memory						
Recog. N/3	.83	.71	M>C	--		
Recall N/9	2.86	3.54	C>M	--	C>M (p=.036)	
Recog. N/6	1.97	2.18	C>M	--	C>M (p=.036)	
Bead Pattern	3.52	3.12	M>C	--		
Total	9.18	9.55	C>M	--		
Discrim. Lrng.[a]						
Simple	6.30	6.10	C>M	--		
Varied	8.72	6.25	C>M	--	C>M (p=.09)	
Extra Dimens.	24.30	22.50	C>M	--		
Total	39.33	34.85	C>M	--		
Problem Solving[a]						
Single Alternat.	29.30	23.10	C>M	--		C>M (p=.04)
Double Alternat.	28.60	29.60	M>C	--		
Total	57.90	52.70	C>M	--		
Gen. Information	16.40	20.00	C>M	--		
Relat. Concepts	19.50	20.60	C>M	--		

---

[a] Superior performance here is indexed by the lower rather than the higher score.

These findings indicate the control training experience to have been more favorable for the development of the conceptual abilities measured; and particularly advantageous in developing the visual memory skills indexed by the Immediate Memory test, as well as the type of learning ability required for achievement on the Discrimination Learning, and the Single and Double Alternation Problem Solving measurements.

CHAPTER 6

RESULTS OF THE COMMUNITY CENTER INVESTIGATION[1]

This mixed age sample consisted of 36 subjects, including three year old as well as four year old entrants. The proportion of experimentals and controls, and boys and girls was roughly comparable for the two age groups, with a slightly higher Negro loading in the younger experimental sample and a slightly higher proportion of Puerto Ricans in the older experimental sample. Again, the sample descriptions (Tables 5 and 6) specify the age of subjects at the time of the assessment, when the older children were approximately five years of age and the younger ones approximately four. These age labels will be used in future references to the two age groups.

TABLE 5

SAMPLE DESCRIPTION FOR FIVE YEAR OLDS

	Mont-1	Mont-2	Control
Age Range	(4-9)-(5-4)	(4-5)-(5-5)	(4-6)-(5-4)
Mean Age	5	5	5
IQ Range	86-98	82-101	63-102
Mean IQ	91	94.7	82
Boys	1	2	5
Girls	3	3	7
Puerto Ricans	2	1	4
Negroes	2	4	8
Total N	4	5	12

---

[1] This assessment was done one month later than the public school evaluation, in July rather than June, since community center classes continued through the summer. Thus the results of this investigation represent training effects of a nine month period as against eight months of schooling in the public school study.

TABLE 6

SAMPLE DESCRIPTION FOR FOUR YEAR OLDS

	Mont-1	Mont-2	Control
Age Range	(3-11)-(4-7)	(3-11)-(4-7)	(3-9)-(4-7)
Mean Age	4-1	4-1	4-3
IQ Range	84-108	94-103	69-120
Mean IQ	97.8	97.5	95.7
Boys	2	1	3
Girls	2	3	4
Puerto Ricans	2	4	2
Negroes	2	0	5
Total N	4	4	7

The following presentation of findings first presents the results for the older age group and then summarizes results for the younger children.

Five Year Olds -- Results of the Global Analysis

Comparisons of the mean achievement levels of the two treatment groups (Table 7) paralleled data for the public school investigation in showing little gross differentiation. Again the magnitude of differences was small and insignificant although larger than in the previous study, with several of these probabilities attaining the 20 percent level. None however were significant, with the exception of the p. of .05, indicated for Immediate Memory.

TABLE 7

MEAN ACHIEVEMENT LEVELS FOR EXPERIMENTALS AND CONTROLS
(five year olds)[a]

Area	Montessori Teachers			Overall Probability[b]
	I	II	Control	
	N=4	N=5	N=12	
Perceptual Discrimination				
Mean	17.9	15.6	15.5	
Median	17.5	18.0	17.5	.25
Range	12-24	6-21	2-22	
Delayed Memory				
Mean	12.5	13.8	12.2	
Median	14.0	14.0	14.0	.15
Range	8-14	13-14	0-14	
Immediate Memory				
Mean	11.6	12.4	9.3	
Median	10.5	12.0	10.0	.05
Range	8-17	11-15	3-12	
Discrimination Learning[c]				
Mean	16.3	26.6	28.9	
Median	15.5	20.0	30.0	.20
Range	13-21	10-43	4-53	
Problem Solving[c]				
Mean	37.3	35.0	42.5	
Median	20.0	24.0	17.0	.30
Range	13-96	13-96	4-96	
General Information				
Mean	20.0	22.2	17.9	
Median	20.5	21.0	16.5	.20
Range	11-28	13-37	6-31	
Relational Concepts				
Mean	23.8	24.8	22.5	
Median	23.5	25.0	23.5	.30
Range	22-26	22-27	13-29	

[a] Data in this table are based solely on total subtest scores.

[b] The findings are averaged by area for the two Montessori teachers and the control teacher. Short-cut overall analyses in each area were performed to estimate the accruing probability, specified in the last column.

[c] Superior performance on Learning Discrimination and Problem Solving (Single and Double Alternation) is indexed by the lower rather than the higher scores.

Nevertheless, it is evident from this table that there was a highly consistent directional trend, discriminating across the board in favor of the Montessori teachers. In this respect, these findings diverged from the public school study. On all of these assessment measures, means for both Montessori teachers were consistently higher than those for the control teacher. Sixteen separate instances were involved (taking into account a total battery score computed as well as subtest scores), with a binomial count of this event yielding a probability of two in 100,000. These results showed a fairly large-scale favorable Montessori impact on a consistency basis. Looking at the data from the consistency angle, it is evident that the overall achievement levels of experimentals and controls here showed a larger positive Montessori effect than was indicated for the public school study.

This picture was also borne out in the comprehensive test pattern analyses to follow, where performance differentials consistently favored the Montessori trained children.

Five Year Olds -- Detailed Analysis of Data

Perceptual Trends. Results of the comprehensive test pattern analysis on the Perceptual Discrimination test (Table 8) provided additional support for the hypothesis in indicating consistently higher task scores for the Montessori trained children. These results further paralleled findings of the previous investigation in documenting the superiority of Montessori training at the low ability level. As was the case in the preceding experiment, the data here yielded significant differences on some of the perceptual tasks (Manikin and Bear Puzzle), similarly discriminating for the poorest achievers (specifically between the Montessori I group and controls). While none of the task comparisons discriminated significantly for the total training group, the directional pattern of mean score differences across ability levels consistently favored the Montessori trained children, replicating the public school findings in this respect as well.

TABLE 8

COMPREHENSIVE TEST PATTERNS FOR EXPERIMENTALS AND CONTROLS ON PERCEPTUAL DISCRIMINATION (five year olds)

	Mean Group Scores			Results		B Level Analysis[a]	
Test	Mont-1	Mont-2	Cont.	Direct.	Sign.	Bottom 10	Top 10
Formboard	2.0	2.0	2.0	M1=C M2=C	-- --		
Manikin	3.8	4.0	3.5	M1>C M2>C	-- --	M>C (p=.10)	
Bear Puzzle	2.8	3.0	2.3	M1>C M2>C	--	M>C (p=.10)	
Block Design	9.3	6.6	7.7	M1>C C>M2	-- --		
Total Score	17.9	15.6	15.5	M1>C M2>C	-- --		

[a] B level analysis is based on pooled data for the two Montessori groups in order to obtain the larger N necessary for this analysis.

The perceptual learning outcomes in the community center investigation were, however, slightly diluted by comparison with the public school experiment. As noted in Table 8, the probability figures on the perceptual tasks discriminating for the bottom ten cases were slightly reduced by comparison with the public school data (Table 3) yielding probabilities in the .04 to .09 range. Further comparison of these two tables also revealed that total subtest scores did not discriminate significantly for the poorest achievers here, as they did in the public school study. This dilution of the Montessori impact is, however, in line with the more casual and less rigorous approach to the sensorial training materials, typifying the Montessori teachers in the community center study. The implication would seem to be that systematic and stringent guidance techniques with these materials are more effective in upgrading the perceptual skills of the less able learners.

Nevertheless, these Montessori groups still demonstrated a consistent pattern of superior achievement on Perceptual Discrimination. They were also characterized by greater speed of performance on this assessment measure, with the experimental and control comparisons of time scores consistently favoring the two Montessori groups. Again the time differential for the two training groups bears some relation to teachers' classroom style. The slower pace of the controls undoubtedly reflected to some extent this control teacher's instructional approach (very demanding of correct responses and quite rejecting of pupil failures), as well as indicating a somewhat greater task challenge for this group. The emergent negative relationship here, between speed of performance and teacher style motivating a cautious problem solving approach, paralleled the previous investigation where the same trend was apparent for a majority of the public school Montessori group.

The fact that these pro-Montessori trends were a clear-cut reversal of the public school trend on the conceptual assessment measures, suggests that these training outcomes may be expected to vary a good deal from one classroom situation to another, as a result of teacher differences in instructional emphases and techniques. Thus it appears that neither Montessori nor conventional prekindergarten strategies are sufficiently structured, with respect to the cognitive training activities prescribed in each instance, to produce uniform teaching efforts. Rather, it seems that what teachers do in this connection and the methods they employ, depend largely on their own judgment and resourcefulness, in the case of both Montessori and conventional teaching.

Conceptual Trends. The comprehensive test patterns on the conceptual measures (Table 9) also showed a superior performance pattern for the Montessori pupils. Significant performance differentials favoring the experimentals obtained on two measures -- Immediate Memory and Discrimination Learning -- in each instance discriminating across ability levels, for the total training groups. These performance differentials were significant for both Montessori teachers on the more difficult Memory tasks (probabilities in the .01 - .05 range), and were significant for the Montessori I group on Discrimination Learning total subtest score (p. of .06). Overall, the directional pattern of mean score differences here was consistently higher for the experimentals, and highly significant -- discriminating at the .007 level for the Montessori I group and at the .002 level for the Montessori II group.

TABLE 9

COMPREHENSIVE TEST PATTERNS FOR EXPERIMENTALS
AND CONTROLS ON CONCEPTUAL MEASURES
(five year olds)

	Mean Group Scores		Results		Mean Group Scores		Results	
Test	Mont-1	Cont.	Direct.	Sign.	Mont-2	Cont.	Direct.	Sign.
Delayed Memory								
Immed. Recog. (no delay)	2.0	1.8	M>C	--	1.8	1.8	M=C	--
4 Minute	3.5	3.7	C>M	--	4.0	3.7	M>C	--
8 Minute	7.0	6.7	M>C	--	8.0	6.7	M>C	[illegible]
Total	12.5	12.2	M>C	--	13.8	12.2	M>C	--
Immed. Memory								
Recog. 1/3	.75	.67	M>C	--	1.0	.67	M>C	--
Recall N/9	3.3	3.6	C>M	--	3.6	3.6	M=C	--
Recog. N/6	3.0	1.9	M>C	p=.02	3.0	1.9	M>C	p=.01
Bead Pattern	4.5	3.1	M>C	--	4.8	3.1	M>C	p=.05
Total	11.6	9.3	M>C	--	12.4	9.3	M>C	p=.04
Discrim. Learning[a]								
Simple	2.3	3.0	M>C	--	3.2	3.0	C>M	--
Varied	2.5	3.3	M>C	--	5.0	3.3	C>M	--
Extra-Dimens.	11.5	22.6	M>C	--	18.4	22.6	M>C	--
Total	16.3	28.9	M>C	p=.06	26.6	28.9	M>C	--
Problem Solving[a]								
Single Alternat.	19.0	19.2	M>C	--	17.6	19.2	M>C	--
Double Alternat.	18.3	23.3	M>C	--	17.4	23.3	M>C	--
Total	37.3	42.5	M>C	--	35.0	42.5	M>C	--
Gen. Information	20.0	17.9	M>C	--	22.2	17.9	M>C	--
Relat. Concepts	23.8	22.5	M>C	--	24.8	22.5	M>C	--

[a] Superior performance here is indexed by the lower rather than the higher score.

In sum, these findings not only documented a reversal of the conceptual trends obtaining in the public school study, but also showed a picture of sharper differentiation in revealing some significant differences across ability levels. (In the public school experiment, detailed analysis of conceptual test patterns yielded significant differences only at the low ability level.) However, the two investigations did dovetail in the following important respect: in both experiments the Immediate Memory and Discrimination Learning tasks discriminated significantly between the two treatment groups, although in different directions in each instance. Insofar as these two measurements consistently discriminated across investigations for the five year olds -- the research identifies visual memory ability and the ability to acquire discriminatory concepts as the specific skills most influenced by instructional practices at this age level. Memory capacity was especially influenced, with more pervasive differences between experimentals and controls in this assessment area in both the public school and community center investigation.

Research Findings for Four Year Olds

With respect to mean achievement levels (Table 10), the picture for the younger age entrants basically paralleled results for the older group, in showing superior performance on this battery for the Montessori trained children. The data here similarly differentiated between experimentals and controls chiefly on a consistency basis rather than in terms of absolute performance differentials. These were quite small with the probability figures mostly in the .30 to .60 range, showing a slight reduction of the positive experimental effect on the battery as a whole.[2] However, we

---

[2] The slight reduction of Montessori's impact for the younger age group may well stem from the complications of mixed age classes, presenting special difficulties for the Montessori teachers due to the immaturity of the younger children in their classes (each experimental group in this investigation included several "problem" youngsters in the younger age bracket). The control teacher on the other hand described her four year olds as fairly mature and presenting no special problems.

TABLE 10

MEAN ACHIEVEMENT LEVELS FOR EXPERIMENTALS AND CONTROLS
(four year olds)[a]

	Montessori Teachers			
Area	I	II	Control	Overall Probability[b]
	N=4	N=5	N=7	
Perceptual Discrimination				
Mean	12.6	11.9	8.0	.09
Median	12.0	12.0	6.0	
Range	5-21	5-18	0-21	
Delayed Memory				
Mean	10.0	14.0	10.8	.33
Median	10.0	14.0	14.0	
Range	6-14	8-14	0-14	
Immediate Memory				
Mean	8.1	8.4	7.8	.38
Median	8.0	8.5	8.0	
Range	0-16	2-14	1-12	
Discrimination Learning[c]				
Mean	44.3	27.5	33.7	.65
Median	38.0	27.0	41.0	
Range	17-77	6-50	8-74	
Problem Solving[c]				
Mean	58.6	54.3	65.3	.48
Median	65.0	56.0	96.0	
Range	9-96	9-96	2-96	
General Information				
Mean	15.0	23.3	13.0	.09
Median	15.0	24.0	13.0	
Range	7-23	14-31	1-28	
Relational Concepts				
Mean	14.5	20.5	18.9	.65
Median	19.0	21.5	20.0	
Range	0-20	12-27	14-23	

[a] Data in this table are based solely on total subtest scores.

[b] The findings are averaged by area for the two Montessori teachers and the control teacher. Short cut overall analyses in each area were performed to estimate the accruing probability specified in the last column.

[c] Superior performance here is indexed by the lower rather than the higher score.

noted two exceptions in the .09 probabilities specified for Perceptual Discrimination and General Information in this table, indicating a considerably stronger Montessori learning impact in these two assessment areas. These trends were further documented by the comprehensive test patterns for the four year olds (Tables 11 and 12).

Although mean achievement levels of experimentals and controls on Perceptual Discrimination and General Information favored Montessori training at both age levels, these differences did not approach significance for the older age entrants (where the probabilities attained only the .20 level on Perceptual Discrimination and the .25 level on General Information). Thus, the effects of training were clearly more pronounced for younger than older children with respect to the perceptual and verbal skills assessed.

Test patterns for the younger age entrants on the perceptual tasks also discriminated across ability levels in terms of speed of performance as well as mean achievement level. These differences likewise favored Montessori teaching, discriminating at the .04 level on both the Manikin and the bear puzzle. Whereas, for the five year olds, the pro-Montessori trend was salient only for the poor perceptual achievers -- with mean achievement level and speed discriminating significantly for this segment of the sample, but not for the average and above average perceptual achievers. Thus, differences obtaining for younger and older children indicate the lower age level to be a more critical period for the development of visual analytic and visual motor integration capacities measured. In pointing up Montessori's substantially greater perceptual learning impact for children beginning training in the three year age stage, the findings support the common practice in privately run Montessori schools of starting pupils between two and a half and three years of age.

TABLE 11

COMPREHENSIVE TEST PATTERNS FOR EXPERIMENTALS
AND CONTROLS ON PERCEPTUAL DISCRIMINATION
(four year olds)

	Mean Group Scores			Results	
Test	Mont-1	Mont-2	Cont.	Direction	Sign.
Formboard	2.0	2.0	2.0	M1 = C M2 = C	-- --
Manikin	3.8	3.8	2.6	M1 > C M2 > C	-- --
Bear Puzzle	1.8	1.8	1.0	M1 > C M2 > C	-- --
Block Design	5.0	4.3	2.4	M1 > C M2 > C	p=.08 --
Total Score	12.6	11.9	8.0	M1 > C M2 > C	p=.08 --

TABLE 12

COMPREHENSIVE TEST PATTERNS FOR EXPERIMENTALS
AND CONTROLS ON CONCEPTUAL MEASURES
(four year olds)

Test	Mean Group Scores		Results		Mean Group Scores		Results	
	Mont-1	Cont.	Direct.	Sign.	Mont-2	Cont.	Direct.	Sign.
Delayed Memory								
Immed. Recog. (no delay)	2.0	1.7	M>C		2.0	1.7	M>C	--
4 Minute	4.0	3.4	M>C		4.0	3.4	M>C	--
8 Minute	4.0	5.7	C>M		8.0	5.7	M>C	--
Total	10.0	10.8	C>M		14.0	10.8	M>C	--
Immed. Memory								
Recog. 1/3	.75	.71	M>C		.75	.71	M>C	--
Recall N/9	2.8	2.4	M>C		2.8	2.4	M>C	--
Recog. N/6	2.0	1.6	M>C		1.5	1.6	C>M	--
Bead Pattern	2.5	3.1	C>M		3.3	3.1	M>C	--
Total	8.1	7.8	M>C		8.4	7.8	M>C	--
Discrim. Learning[a]								
Simple	3.5	2.9	C>M		2.5	2.9	M>C	--
Varied	18.3	8.1	C>M		4.5	8.1	M>C	--
Extra-Dimens.	22.5	22.7	M>C		20.5	22.7	M>C	--
Total	44.3	33.7	C>M		27.5	33.7	M>C	--
Problem Solving[a]								
Single Alternat.	29.8	28.7	C>M		26.8	28.7	M>C	--
Double Alternat.	28.8	36.6	M>C		27.5	36.6	M>C	--
Total	58.6	65.3	M>C		54.3	65.3	M>C	--
Gen. Information	15.0	13.0	M>C		23.3	13.0	M>C	p=.08
Relat. Concepts	14.5	18.9	C>M		20.5	18.9	M>C	--

[a] Superior performance here is indexed by the lower rather than the higher score.

The Overall Picture of Training Effects for Younger and Older Children

Considering the research findings for the two age groups, the resultant experimental effect was actually quite striking in this investigation, particularly in view of the twofold replication by teachers and age. In fact, examination of performance patterns for the total sample, including both age groups, and involving a total of 32 experimental and control comparisons indicated that: 27/32 at the five year level and 23/32 at the four year level favored Montessori training (although the magnitude of these differences was quite small).[3]

The results of this investigation also provided substantial indications of differences between the two Montessori teachers, notwithstanding their basically similar classroom approach. Differential learning outcomes were apparent for the two experimental groups in the following respects: The Montessori I group, both younger and older children, consistently performed at a higher level than the Montessori II group in the perceptual area, and also differed the most from controls (experimental and control comparisons consistently discriminated for Teacher I). The greater effectiveness of this teacher regarding perceptual training efforts was also apparent in terms of speed of performance as well as overall achievement level. Comparative performance profiles for the two Montessori teachers, summarizing the data for both age groups (Table 1, Section A, Appendix), showed the Montessori I group to obtain lower mean time scores on the perceptual tasks as well as higher mean achievement scores overall. And this teacher differential held up across age levels.

Since the Montessori I teacher was the more experienced of the two instructors as well as the more competent regarding implementation of prescribed techniques -- these findings attest to the greater perceptual learning value of Montessori methods, when applied by a well trained teacher. By the same token, they affirm the efficacy of the training methodology relevant to the perceptual aspect of development.

---

[3] The data illustrating age trends on this battery is summarized in the Appendix to Part I. (See Table 1, Section A.)

On the other hand, the Montessori II group, instructed by the novice Montessori teacher, was superior on the conceptual part of the assessment battery. In fact, this table showed higher scores on 22/32 comparisons for the Montessori II teacher, a directional trend significant at the .06 level (although the experimental and control comparisons tended to shade Teacher II more toward the control teacher, with respect to absolute performance differentials). The superiority of this Montessori instructor was chiefly evident on the highly verbal measures and in the memory area, where her pupils, both younger and older children, consistently performed at a higher level than the Montessori I group. This teacher differential, ipso facto, suggests that other teacher practices less related to prescribed techniques, underlie differences in achievement in these learning areas, and are more relevant to the development of verbal abilities and memory capacity.

It may well be that the greater effectiveness of the less experienced and skilled Montessori teacher in these assessment areas hinged upon her more extensive language training emphasis (vocabulary and concept development through songs, stories, games) and perhaps too, her tendency to be more talkative, thereby providing more repetitive aural language exposure for her group. For these levels of language experience are clearly relevant for development of verbal and memory skills.

CHAPTER 7

A SUMMARY OF TRAINING EFFECTS

This chapter has two sections -- the first providing an overview of the main treatment trends in the two investigations, and the second a comprehensive summary of training effects and their educational implications. Age, sex, and ethnicity trends are presented in Section A of the Appendix to Part I.

An Overview of the Two Investigations

In each investigation, clear-cut treatment trends discriminating between the experimentals and controls showed basic similarities as well as differences.

With respect to perceptual training trends, the public school and community center studies concurred. Results in each case consistently discriminated in favor of the Montessori trained children, in support of the hypothesis, and at both age levels investigated. However, results on the cognitive achievement measures showed a reversal of treatment trends for the two studies. The public school findings consistently favored the control group, whereas the community center data consistently favored the experimental groups of both Montessori teachers, and for younger as well as older age entrants.

To illustrate the global picture of these training effects for the two investigations, Table 13 was constructed. This table provides a birds-eye view of the positive experimental effects (favoring Montessori training) and the negative experimental effects (favoring the control approach). The data was based on the five year old samples, but the treatment trends illustrated were replicated in the younger age group.

TABLE 13

PERCENTAGE DIFFERENCE IN MEAN AREA SCORES IN THE TWO MONTESSORI INVESTIGATIONS

Area	Exp. I (Public School)	Exp. II (Community Center)
Simple Perceptual Discrimination	3.6%	7.2%
Delayed Memory	- 1.0%	7.6%
Immediate Memory	- 3.2%	22.5%
Discrimination Learning	-12.7%	34.2%
Problem Solving	- 8.9%	17.8%
General Information	-35.7%	22.7%
Relational Concepts	- 5.6%	3.3%
Total Score	-10.9%	12.1%

Entries in this table were simple percentages obtained by dividing the differences between experimental and control mean scores in each study, separately by area, by the Montessori figure to obtain a kind of percentage change, or savings score.[1] Inspection of this table shows that in the first investigation the values on all the cognitive measures were negative, indicating consistently superior performance for the control condition with this situation clearly reversed in the second experiment

---

[1] Entries in this table are based on total subtest scores representing mean achievement levels in the various assessment areas.

(where all of these values were positive). By contrast, the Perceptual Discrimination measure stands out as a unit in itself -- the only assessment measure where the superiority of the Montessori groups over the control groups emerged in both investigations, although actual differences were small in both instances.

Table 13 also reveals two additional groupings. One consists of Delayed Reaction, Immediate Memory, Discrimination Learning and Problem Solving. In these four areas, a fairly small negative difference in the first investigation was counteracted by a relatively large positive one in the second study. The overall size of these differences was again far from large. The third group consists of General Information and Relational Concepts, where a small positive difference in the second experiment was overcome by a larger negative difference in the first, yielding an overall negative figure. On these two highly verbal measures, Montessori's negative impact in the public school experiment was chiefly due to experimental-control differentials for the Puerto Rican children on the measurement indexing understanding of relational concepts -- where differences discriminated in favor of the Puerto Rican control sample at the .03 level. This finding is attributed to the control teacher's more language oriented classroom style (teacher differences being very pronounced in this respect).

The advantage of an oral language emphasis for children with a language handicap was similarly apparent in the community center, where a comparable trend obtained. However, in this case, it was the Montessori teachers who displayed a more language oriented style rather than the control teacher. Although teacher differences were not as extreme here as they were in the public school, these experimental and control comparisons for the Puerto Rican children still yielded near significant differences (p. of .10) favoring the Montessori subjects -- again demonstrating the importance of language stimulation in upgrading the verbal functioning of children whose native language is not English.

Although the actual magnitude of the differences between the experimentals and controls was not large in either investigation, the treatment trends illustrated in Table 13 were, notwithstanding, highly consistent and significant. Moreover, certain considerations negated the probability of chance factors influencing results. In the first place, given the built-in replication in the community center study (by way of two teachers and two age groups) as well as the consistency of results at both age levels, it is likely that comparable results would obtain in future replications. Whereas in the public school experiment, the larger N enhanced reliability and overcame the lack of internal replication; furthermore, the possibility of teacher contamination here may be ruled out, since the two public school teachers had little to do with one another as a result of interpersonal friction.

In the second place, directional trends on the cognitive achievement measures were corroborated by the results of a supplementary evaluation device, which has been widely used with young children to estimate intellectual capacity. This was an adaptation of the draw a person test, where subjects were asked to "draw a picture of yourself." This test was administered to all the five year old subjects, independently of the assessment battery, by different examiners (in this case, the same testers who conducted the evaluation of cognitive patterning). These drawings were scored as follows: one point was given for each hand, foot and eye, the mouth, nose, etc., with the total score representing the number of body parts included. For the public school sample, the drawings also discriminated in favor of the controls at the .01 level of significance. Again the trend was reversed for the community center sample, where the data favored the experimentals, discriminating here for the Montessori I teacher at the .03 level.

Insofar as these considerations argue against the possibility of chance factors influencing results on the cognitive measurements, within-treatment differences (elaborated in Chapter 3) are a more plausible explanation for the reversal of trends in the two experiments. In fact, when we consider pupil outcomes on the cognitive achievement measures in each investigation in relation to teacher styles of implementing Montessori and "traditional" practices, the data actually shows a convergence effect across experiments. For teacher comparisons, based on a learning press analysis of classroom climates, identified certain classroom press characteristics which were positively related to achievement on these assessment measures in both investigations. In each case, the following press characteristics were notably more pronounced for the high performance groups (Montessori in the community center and the controls in the public school) than for the low performance groups:

-- A greater classroom emphasis on oral language, both receptive and expressive speech. The more effective teaching models were

8

characterized by more consistent efforts to provide language stimulation via informal teacher dialogue with children, as well as formal teaching activities (stories, songs, auditory discrimination exercises). And they did more to activate pupil communication and conceptualization via group discussion and questioning.

-- Teacher-child transactions which were comparatively flexible and open ended, affording somewhat more scope for pupil exploration and spontaneity in responding. This teaching style was observed more consistently for the effective teaching models. Whereas, the instructional transactions of the less effective teachers were apt to be more tightly prescribed and structured, and at times mechanistic.

-- A diversified stimulus environment, providing a wider range of activity choices, and overall more leeway for self-expressive, imaginative outlets. From this standpoint, the two less effective teaching models typified more restrictive learning environments, as a result of these teachers' stronger concerns with achievement per se, and their more exclusive concentration on cognitive training activities. (Neither of these classrooms, for example, included dramatic play stimuli such as puppets or housekeeping corner.)

These particular classroom press characteristics also served to differentiate on a within treatment basis -- predominating to a greater extent for the high achieving Montessori sample in the community center than for the low achieving public school Montessori sample, and differentiating in the same direction for the two control groups. Given the consistency of these training trends, the data implies that for socio-economically disadvantaged children, the classroom practices specified for the better performance groups promote the specific abilities assessed; and can be expected to strengthen the training impact of both Montessori and conventional teaching approaches in these achievement areas.

A Summation of Training Trends and Their Educational Implications

Perceptual Functioning. Systematic treatment trends differentiated between Montessori and conventional training approaches in terms of their perceptual training impact. These trends consistently favored Montessori training in both the public school and community center studies, for both age levels investigated -- in support of the hypothesis that Montessori teaching should be more effective in upgrading perceptual discriminatory/analytic skills and visual-motor integration capacity. The replication of this pro-Montessori trend in two independent comparison studies, sampling quite different Montessori prototypes, and on two age levels identified Montessori's highly programmed perceptual training strategy as a major strength of this prekindergarten model.[2]

Montessori's advantage in this respect, however, was chiefly notable for the children showing minimal perceptual skills (whose achievement)

---

[2] Even presuming special efforts on the part of highly motivated teachers, conventional techniques are apt to fall short of the mark for disadvantaged learners. This supposition is borne out to some extent by results in the community center investigation, where the control teacher provided a fairly heavy dose of formal, perceptual discriminatory training with conventional teaching materials. Despite this teacher's systematic efforts, differences between experimentals and controls consistently favored the Montessori sample, both younger and older age entrants.

Montessori's advantage in this respect, however, was chiefly notable for the children showing minimal perceptual skills (whose achievement level on the perceptual part of the assessment battery placed them in the bottom third of the class range). This finding substantiates the merits of a systematized and sequenced perceptual training technology, such as the Montessori sensorial materials and didactic techniques afford, particularly for youngsters manifesting perceptual disabilities and/or slow learning children. Thus the research has generated a recommendation for more extensive experimentation with these techniques for such learners, who especially need a solid perceptual foundation. In this connection, the indications are that Montessori teaching is most effective when the sensorial exercises (which constitute the hard core of perceptual training in a Montessori classroom) are used in a fairly rigorous albeit not rigid fashion. Comparison of pupil achievement profiles for the three Montessori teachers participating in this project showed sharper differentiation of experimentals and controls for the teacher implementing the prescribed training procedures most systematically and rigorously.

Cognitive Functioning. The achievement patterns of Montessori and control subjects with respect to the cognitive abilities measured did not show any comparable systematic trends favoring one teaching approach or the other. On the contrary, the data showed a large component of within treatment variability for the Montessori and conventional teaching prototypes investigated in the public school and the community center -- and a resultant reversal of directional trends in the two studies.

In the light of these findings, there is little justification for expecting Montessori teachers on the average to do a better job than conventionally trained teachers of upgrading the specific cognitive abilities assessed (memory, discrimination learning, problem solving, knowledge of concepts, general information and comprehension). It is rather evident that: the quality of intellective stimulation in Montessori classrooms can vary a good deal, as is the case with conventional teaching efforts; pupil outcomes are largely dependent upon the individual teacher's mode of structuring the classroom environment, her teaching preferences and capabilities, and the resultant learning press (findings which caution against reliance on treatment labels in seeking to interpret evaluations of contrast teaching approaches, pointing up the need for specifying treatments in terms of the operant classroom press).

Given the demonstrable variability of Montessori teacher practices relevant for cognitive skills development, this aspect of Montessori training appears to be considerably less systematized and formalized than the perceptual training strategies. However, this finding comes as no surprise since Maria Montessori's pedagogy for younger children specifically emphasized sensorial training, and the development of a sound perceptual foundation.

Undoubtedly, Montessori prekindergarten practice as well as conventional training would be strengthened by increased structuring of cognitive training activities, as far as socio-economically deprived youngsters are concerned (particularly in view of the fact that recent prekindergarten surveys repeatedly cite the greater cognitive benefits of structured teaching approaches for these pupils). Curriculum modification in this direction, providing more explicit guidelines for teachers, should contribute appreciably to Montessori's training potential with this population.

Certainly continuing experimentation and research will be necessary to establish the specific teacher practices that are most effective in advancing the cognitive skills of three and four year olds from this socio-economic strata. However, this investigation does suggest that certain classroom practices are likely to upgrade pupil functioning with respect to the specific abilities assessed. Certain classroom press characteristics were consistently and positively associated with achievement on the cognitive ability measurements: 1. repetitive oral language stimulation, by way of teachers' informal dialogues with children as well as formal teaching activity; 2. a diversified stimulus environment affording some self-expressive, imaginative outlets in addition to cognitive training activities; and 3. flexible and open-ended rather than tightly prescribed and structured instructional transactions. The relative contribution of these factors to cognitive achievement levels in the areas measured, and the extent to which they may discriminate beyond the scope of this assessment (which did not investigate causal thinking or classification behavior) are questions, which hopefully, will spark the interest of future investigators.

–

In sum, it must be stated that training effects were modest rather than extreme, discriminating between experimentals and controls chiefly on a consistency basis and to a lesser extent on a magnitude basis. Although there were highly consistent and significant directional trends in both the public school and community center studies, pointing up the influence of training practices on perceptual and cognitive achievement -- absolute performance differentials for Montessori and conventionally taught children were slight, showing roughly comparable achievement levels for the two groups.

While this was the case for the majority of the sample, training effects were considerably more pronounced for the low achieving pupils -- children doing very poorly on the assessment measures and scoring in the bottom third of the class range. The sharper differentiation apparent for experimentals and controls at the low ability level suggests that: instructional practices at the prekindergarten level can be expected to make a greater difference as far as the achievement of less proficient learners is concerned; and to have a less significant impact on the achievement of children demonstrating average or superior competence (who show greater capacity to learn, irrespective of specific training techniques). This finding is also important from a methodological standpoint, since it implies the need for evaluation procedures which examine training effects for the extremes of the pupil population, as well as specifying results for the average learner.

The impact of instructional practices on the less able learners was salient in three assessment areas -- Perceptual Discrimination, Immediate Memory, and Discrimination Learning. All three measurements yielded some sizable and significant absolute performance differentials, discriminating at the low ability level for both the public school and community center samples -- a finding which points up the potential of a sound prekindergarten training technology in upgrading these particular abilities.

On the whole, the assessment picture for the three year old entrants included in the community center investigation paralleled results for the older age group here, showing a high degree of internal consistency. However, the results for the three year old entrants showed more extreme differentiation of experimentals and controls on the Perceptual Discrimination Test and the most highly verbal assessment measure, General Information and Comprehension. Both measurements discriminated significantly on a magnitude basis, across ability levels, in this age group, showing the perceptual and verbal functioning of the younger children to be more sharply affected by training procedures. This finding suggests that instructional practices are particularly important for the development of perceptual and verbal skills for children beginning training at earlier developmental stages (three years of age and below), although the small size of the age samples in this study requires additional research validation.

Bearing in mind the fact that this assessment was limited to the first year of training, it is quite possible that successive evaluations over an extended period of schooling (two or three years) might show more extreme training effects. Certainly speculation in this direction indicates the need for longitudinal research to assess long-range effects.

PART II ASSESSMENT OF COGNITIVE STYLE PATTERNING

Chapter | | Page

8 INTRODUCTION 62

Instrumentation 63

Administration Procedures and Methods of Data Analysis 65

The Sample. 65

9 RESULTS OF THE PUBLIC SCHOOL INVESTIGATION 66

A Summary of Findings 66

10 RESULTS OF THE COMMUNITY CENTER INVESTIGATION. 73

Research Findngs for the Five Year Olds 74

Findings for the Four Year Olds 80

11 A SUMMARY OF TRAINING EFFECTS. 88

An Overview of the Two Investigations 88

CHAPTER 8[1]

INTRODUCTION

The assessment of cognitive styles included comparisons of the experimental and control populations on a range of behavior variables. This stage of the research was designed to test the following major and subhypotheses:

Major Hypothesis. Children undergoing Montessori training will be differentiable from children exposed to conventional teaching in terms of cognitive sets, having relevance for self-regulatory, autonomous problem-solving strategies.

Subhypotheses. The specific subhypotheses under investigation were:

1. Montessori schooled youngsters will differ from conventionally taught youngsters in the direction of --
    a. stronger motor impulse control
    b. a more field-independent, perceptual analytic orientation
    c. greater task persistence
    d. a more confident, self-reliant achievement set.
2. Children undergoing Montessori training will demonstrate greater efficiency in dealing with structured problem solving tasks.
3. Conventionally taught children will be characterized by more spontaneous exploratory tendencies, in unstructured, ambiguous problem-solving situations.

---

[1] As stated in Part I, Chapter 2, Research Design, this phase of the investigation was actually conducted prior to the assessment of perceptual and cognitive skills. This sequence was designed to offset any learning effects engendered by an antecedent, intensive testing experience, and a resultant contamination of the schooling effects being investigated here.

Instrumentation

This evaluation was based on the Cincinnati Autonomy Test Battery, a recently developed prekindergarten instrument designed to assess a range of cognitive characteristics, relating to these cognitive sets.[2] The choice of this instrument was based on several considerations: 1. its appropriateness for testing the hypotheses; 2. its applicability for a population with language difficulties; and 3. the high interest level of the test materials for prekindergarten children.

The CATB, in contrast to the test battery used to assess perceptual and cognitive abilities, shows a reduced correlation with intelligence test performance, as might be expected since this instrument indexes stylistic aspects of cognitive functioning. Thus the correlations for this instrument are considerably lower, chiefly in the .20 range and below.

Nine subtests were selected from this battery. They included seven experimental problem-solving measures (two unstructured tasks and five structured tasks), as well as two examiner rating scales. These measurements were the following:

Unstructured Problem-Solving Tasks. These two measurements assess spontaneous exploratory behavior with the test stimuli in the absence of examiner directives, specifically indexing child's activity level with the stimulus material in ambiguous task situations.

---

[2] The CATB was designed by Dr. Thomas Banta of the University of Cincinnati, and has been used extensively on an experimental basis. Reliability and validity data appears in Volume I of Cognitive Studies, edited by Jerome Hellmuth, Special Child Publications, Seattle, Washington, 1968.

1. Task Initiation - Child is presented with a set of toy animals and examiner says nothing, merely recording behavior. If S does not initiate play, examiner prompts (but in this case no credit is given).

2. Curiosity Box - Examiner invites child to play with this gadget (a large box with manipulable levers and knobs) and then records behavior.

Structured Problem-Solving Tasks. These measurements index cognitive strategies in a stimulus situation, where the task is explicitly structured by the examiner.

1. Draw A Line Slowly - a measure of motor impulse control.

2. Matching Figures Test - a measure of reflectivity.

3. Dog and Bone Test - a measure of innovative behavior.

4. Embedded Figures Test - a measure of field independence (perceptual/analytic orientation).

5. Persistence Puzzle - a measure of task persistence.

Examiner Rating Scales. These two measurements include examiner appraisals of response set in the testing situation, with reference to:

1. Task Competence -- ratings of task involvement, persistence, and receptivity to challenging tasks.

2. Social Competence -- ratings of social confidence, poise and self-reliance as contrasted with the need for praise or reassurance in the testing situation.

To the degree that these cognitive orientations have special relevance for autonomous functioning in problem-solving contexts, the child's behavior tendencies in these directions afford a measure of the extent to which autonomy characterizes cognitive patterning.

Administrative Procedures and Methods of Data Analysis

This battery was administered individually in one session by two female examiners, neither of whom participated in the evaluation of perceptual and cognitive abilities. Testing time was approximately one hour.

Data analysis procedures paralleled the global analysis of mean group scores in the other phase of this research. As was the case on the achievement measures, the statistical procedure here also employed phi group comparisons, involving the conversion of ϕ coefficients to t values.

The Sample

The total N was 92 subjects. These were the same children tested on the perceptual and cognitive ability measures, with a slight alteration in sample size of both the public school and community center populations (the former was reduced by a few cases and the latter increased by a few). Precise sample descriptions are included in the following chapters, summarizing the results of this investigation.

CHAPTER 9

RESULTS OF THE PUBLIC SCHOOL INVESTIGATION

The sample composition here was the following:

TABLE II-1

SAMPLE CHARACTERISTICS

	Montessori	Control
Age Range	(4-6)-(5-5)	(4-6)-(5-5)
Mean Age	5-0	4-10
IQ Range	54-116	63-110
Mean IQ	82.9	84-12
Boys	11	13
Girls	17	12
Puerto Rican	16	11
Negro	12	14
N=	28	25

A Summary of Findings

Results showed significant differentiation of experimentals and controls with respect to the cognitive style variables measured, in support of the major hypothesis. Four of the nine measurements discriminated significantly between the two groups in terms of mean achievement levels (Table II-1), with probabilities in the .01-.036 range, and one attained the .08 level of significance.

These differences demonstrated that the Montessori and control subjects differed chiefly in terms of performance on the structured problem-solving tasks, whereas performance differentials on the unstructured tasks were small and insignificant.

The predominant directional trend here favored the Montessori pupils, who attained higher mean scores on all but one of the five measures discriminating significantly. The directional pattern of mean score differences on two of the remaining measures also favored the experimentals. The controls showed higher achievement levels on three of the CATB measurements, but only one of these discriminated significantly. Thus, the overall training picture showed more positive experimental effects.

Evidence Germane to the Subhypotheses. Table II-2 indicated substantial support for subhypothesis 1 as follows: The Motor Impulse Control and Field Independence measures discriminated significantly in favor of the Montessori pupils, with probabilities in the .01 to .036 range. This group also achieved significantly higher Social Competence ratings, with differences here yielding a p. of .036 and demonstrating a more confident, self-reliant achievement set for the Montessori trained children. Differences on the Task Persistence measure further discriminated in the same direction at the .08 level of significance. Thus results bear out the prediction that Montessori teaching should be more productive of these cognitive orientations.

In these assessment areas, differences between experimentals and controls were most extreme on the Field Independence measurement (Embedded Figures Test). In fact, this test showed the highest probability figure

TABLE II-2

MEAN ACHIEVEMENT SCORES FOR EXPERIMENTAL AND CONTROLS

	Area	Montessori	Control	Significance Level[a]
Unstructured Tasks	Task Initiation			
	Mean	1.7	2.2	
	Median	1	1	p=-.14
	Range	1-4	1-4	
	Curiosity			
	Mean	18.67	20	
	Median	19	22	p=-.47
	Range	0-39	0-37	
Structured Tasks	Motor Impulse Control[b]			
	Mean	.60	.83	
	Median	.44	.69	p=.036
	Range	.13-2.5	.26-2.5	
	Reflectivity (MFT)			
	Mean	4.73	5.29	
	Median	5	6	p=-.04
	Range	1-8	0-8	
	Innovation			
	Mean	4.22	3.75	
	Median	4	4	p=.48
	Range	0-17	0-14	
	Field Independence (EFT)			
	Mean	12.61	10.95	
	Median	13	11.5	p=.01
	Range	2-18	7-15	
	Persistence			
	Mean	9.16	8.33	
	Median	12	12	p=.08
	Range	6-12	6-12	
Rating Scales	Task Competence			
	Mean	12.9	11.6	
	Median	12	12	p-.47
	Range	6-19	7-16	
	Social Competence			
	Mean	12.8	11.6	
	Median	12	12	p=.036
	Range	9-18	5-16	

[a] A negative sign indicates C > M.

[b] On this test, lower score is indicative of higher achievement; i.e., better control of Impulsivity.

(p. of .01) of all the assessment measures, indicating the two treatment groups to be most sharply differentiable in terms of a field independent and perceptual/analytic orientation. Since this assessment measure did not discriminate at a comparable level of significance in the community center, its greater discriminatory power here is attributable to the particular strategies of the public school Montessori teacher.

There was, to be sure, a much sharper contrast between the public school Montessori and control teacher than was apparent for the community center Montessori and control teachers, in the following respects. The public school Montessori teacher as compared with the control was more demanding of pupil independence and self-reliance -- factors which should encourage a more field independent problem-solving style. This Montessori teacher also did a good deal more to reinforce perceptual centering on relevant task considerations in her method of structuring individualized and small group activities. Work routines in her classroom also accentuated figure-ground relationships, in that children were taught to lay out training materials on a color contrast rug for floor work, or a contrasting mat for table work. Undoubtedly, these Montessori teacher practices helped to strengthen perceptual analytic skills of the experimentals in the public school, and contributed to the more pronounced differentiation of experimentals and controls on the Embedded Figure Test in this sample.

Trends on the structured problem-solving tasks showed results consistent with subhypothesis 2 in demonstrating superior performance for the Montessori sample on four of the five structured tasks.

With respect to subhypothesis 3, predicting a more spontaneous exploratory set for the controls in unstructured, ambiguous problem-solving situations, the findings were in the expected direction -- although differences in mean group scores on the two relevant measurements (Task Initiation and Curiosity) were not significant. Moreover, as the following paragraph indicates, supplementary group comparisons of response patterns on these two unstructured tasks did yield significant differences in the direction hypothesized.

In addition to the experimental and control comparisons of mean achievement scores on Task Initiation and Curiosity, the data analysis included a supplementary evaluation. This involved group comparisons of response styles for the two measurements combined, in order to obtain a comprehensive index of spontaneity in ambiguous problem-solving contexts. Children who did not need an examiner-prompt on either task in order to initiate exploratory behavior with the test materials, were designated high spontaneity respondents; and children who required a prompt on both tasks were labelled low spontaneity respondents. Chi-square comparisons based on 2 x 2 contingency tables revealed a significantly higher proportion of low spontaneity respondents in the Montessori sample, indicating for this group a more cautious and constrained approach to problem-solving situations where no explicit procedural directives were given.

Additional Findings. The one assessment area where mean group scores discriminated significantly in favor of the controls was the Reflectivity measurement (Matching Figures Test). Although the Montessori children demonstrated stronger impulsivity control on a strictly motoric level, they nevertheless showed a less reflective task orientation to the type of problem-solving challenge defined by the Matching Figures Test (where visual discrimination of pictorial likenesses and differences is the nature of the task). Insofar as the Montessori teacher stressed precision and care in working with the training materials, these results were surprising. On the other hand, the community center data for this age level did favor the experimentals, suggesting that another type of classroom variable must be considered in seeking to account for these differing directional trends in the two investigations -- namely, the personality of the teacher.

What may be the crucial factor here is the extent of the teacher's own tendency toward reflectivity or impulsivity. For Kagan's research specifies this teacher variable to be an influential determinant of pupil reflectivity in the first grade -- presumably as a result of social modeling effects, as well as stronger social reinforcements from the teacher, in line with her own disposition toward impulsivity or reflectivity.

-

The overall assessment picture here demonstrated children undergoing Montessori and conventional prekindergarten training to be clearly differentiable in terms of cognitive style patterning. Training outcomes specified the Montessori approach as more reinforcing of autonomous functioning in the specific directions hypothesized, particularly with reference to Motor Impulse Control, Field Independence and achievement set, with the sharpest differences between experimentals and controls obtaining in these assessment areas. The Montessori sample also did consistently better on structured problem solving tasks, whereas the conventionally taught pupils displayed more spontaneity in dealing with unstructured, open ended problem situations, as well as significantly higher Reflectivity scores. Since the experimental and control comparisons involved a highly structured, directive, and exacting Montessori prototype as compared to a quite typical conventional prototype, future replications comparing similar models should show comparable differentiation.

CHAPTER 10

RESULTS OF THE COMMUNITY CENTER INVESTIGATION

Both the Montessori and conventional teaching prototypes investigated in the community center study typified different sorts of learning environments from their public school counterparts. In the community center, the two Montessori milieus represented a comparatively more free-wheeling instructional approach, and a more informal, diversified learning environment. The control model in the community center was also different, somewhat atypical in terms of her unusually strong achievement focus and her emphasis on formal, structured teaching (chiefly on a small group basis). Sample descriptions for the two age groups included in this investigation are given in Tables II-3 and II-4.

TABLE II-3

SAMPLE DESCRIPTIONS FOR THE FIVE YEAR OLDS

	Mont-1	Mont-2	Control
Age Range	(4-9)-(5-4)	(4-5)-(5-5)	(4-6)-(5-4)
Mean Age	5.0	5.0	5.0
IQ Range	86-103	82-101	63-102
Mean IQ	93-4	92-0	82-4
Boys	2	2	6
Girls	3	3	8
Puerto Rican	2	2	5
Negro	3	3	9
N=	5	5	14

TABLE II-4

SAMPLE DESCRIPTION FOR THE FOUR YEAR OLDS

	Montessori	Control
Age Range	(3-11)-(4-7)	(3-11)-(4-9)
Mean Age	4-2	4-3
IQ Range	84-103	84-118
Mean IQ	94.3	96.6
Boys	3	3
Girls	4	5
Puerto Rican	1	1
Negro	6	7
N=	7	8

Research Findings for the Five Year Olds

Results, summarized in Table II-5, paralleled training trends in the public school, notwithstanding the differences between the community center and public school classroom models. As was the case in the preceding study, some of the assessment measures also discriminated significantly here; and similarly showed the most pronounced differentiation of experimentals and controls on the structured task measurements.

The directional trend was again pro-Montessori with the data here, however, showing more extensive differentiation of experimentals and controls; and overall, a larger scale positive experimental effect. Six of the nine assessment measures yielded overall probabilities ranging from .005 to .05, and one discriminated at the .09 level of significance, with all of these differences favoring the Montessori sample. Moreover, the directional pattern of mean group scores here uniformly favored the

TABLE II-5

MEAN ACHIEVEMENT SCORES FOR EXPERIMENTAL AND CONTROLS (FIVE YEAR OLDS)

	Area	Mont. I	Mont. II	Control	Overall Probability[a]
Unstructured Tasks	Task Initiation				
	Mean	1.4	2	1.54	
	Median	1	3	3	.12
	Range	1-3	1-4	1-4	
	Curiosity				
	Mean	16.4	19.2	16.3	
	Median	19	19	18	.23
	Range	0-29	12-29	1-24	
Structured Tasks	Motor Impulse Control[b]				
	Mean	.43	.65	.65	
	Median	.36	.67	.48	.05
	Range	.18-.87	.20-1.17	.14-1.64	
	Reflectivity (MFT)				
	Mean	6	7	6.4	
	Median	6	7	6	.02
	Range	5-7	3-9	5-10	
	Innovation				
	Mean	8.4	4.8	5.1	
	Median	8	3	4.5	.02
	Range	1-15	2-11	0-12	
	Field Independence (EFT)				
	Mean	13	14.4	12.9	
	Median	12	17	14	.09
	Range	10-17	10-17	7-20	
	Persistence				
	Mean	11.8	9	8.5	
	Median	12	10.5	10.1	.03
	Range	11-12	4-11	11-12	
Rating Scales	Task Competence				
	Mean	13.6	13.8	12.1	
	Median	14	12	12	.04
	Range	12-16	9-19	10-16	
	Social Competence				
	Mean	13.8	14.4	12.2	
	Median	14	14	12	.005
	Range	12-15	10-18	9-16	

[a] The findings were averaged by area for the two Montessori teachers and the control. Short-cut overall analyses in each area were performed to estimate the accruing probabilities in the last column, and similarly in the following table.

[b] On this test, lower score is indicative of higher achievement; i.e., better control of impulsivity.

Montessori trained children, with this directional trend obtaining the .055 level of significance for each Montessori teacher.

Findings Germane to the Subhypotheses. Test patterns on the various measurements provided additional support for subhypotheses 1 and 2, corroborating the public school pro-Montessori trends. The data in Table II-5 similarly discriminated in favor of the Montessori sample with respect to Motor Impulse Control, Field Independence, and Task Persistence -- and likewise showed a more positive achievement set (Social Competence ratings) for this group. Again, the Montessori pupils demonstrated superior performance on the structured tasks, as was the case in the preceding investigation. In addition to these trends, significant differences favoring Montessori teaching also obtained on the Innovative Behavior measure and the Task Competence Rating Scale in this study.

Inspection of the probabilities in Table II-5 shows larger and more significant differences for the Social Competence Rating Scale (p. of .005) than for any of the other measurements. The sharper discriminatory power of these ratings is attributed to characteristics of the community center teachers, which seem likely to have augmented the differentiation in this study. What is specifically referred to here is the control teacher's atypically strong preoccupation with pupil achievement, as well as her tendency to be rejecting of children, who failed to meet her standards for successful performance in the course of formal group instruction. Assuming that these factors created a somewhat stressful achievement press in her classroom, with respect to teacher directed activities, we might expect a heightening of pupil anxiety and a reduction of social ease in the testing situation -- particularly when we consider its implications of possible failure in the presence of a teacher surrogate. Proceeding on this assumption, some depression of the control ratings would be likely on the Social Competence Scale, with a resultant inflation of Montessori's positive impact (although it is probable that the Montessori subjects would have rated higher in any case, in the light of the positive Montessori trend on these ratings in the public school).

Moreover, the impact of these control teacher characteristics, in conjunction with highly mechanistic and controlled instructional transactions (see chapter on classroom profiles, Part I, for description), would be likely to have a negative effect on learner involvement and attentiveness in teacher guided activities. Thus, the findings that the controls in this study also rated significantly lower on the Task Competence ratings, indexing involvement and distractibility, is further consistent with teacher behavior in the community center, and explicable on this basis -- particularly, since these ratings did not discriminate significantly in the public school.

The one assessment area in which the data did not justify rejection of the null hypothesis, relates to pupil behavior in unstructured, ambiguous problem-solving situations (subhypothesis 3). Neither the directional pattern of mean group scores nor the proportion of experimentals and controls requiring an examiner prompt on the Task Initiation and Curiosity measures, indicated an advantage for conventional teaching with respect to spontaneity in these task contexts. In fact, these trends, though not significant, favored the Montessori sample slightly (in contrast to the public school data favoring the controls on these two measurements). Since neither mean score differences nor supplementary analysis discriminated significantly here, the effects of Montessori and conventional approaches in this study were more comparable in terms of supporting a spontaneous exploratory problem-solving set. However, the importance of individual teacher styles is highlighted by the positive experimental effect in one investigation, and the negative experimental effect in the other, with these results indicating that more flexible styles of implementing Montessori practices do not have an inhibiting effect.

Teacher Trends. Pupil test profiles for the two Montessori teachers showed some systematic differentials. Table II-5 revealed a consistent pattern of higher mean scores for the Montessori I group on the measures of Motor Impulse Control, Innovation and Task Persistence, as well as higher Task Competence ratings for this group. Three of these measurements discriminated significantly between the two Montessori teachers with differences attaining probabilities in the .053 to .10 range: namely, Motor Impulse Control, Innovative Behavior and Task Persistence (specifically, the distractibility index built into the Task Persistence measure). Two of these measurements, Innovation and Task Persistence, also discriminated significantly between the Montessori I group and the controls, as did the Task Competence ratings. (None of these measures, however, discriminated for the Montessori II group as compared to the controls.)

Consideration of some of the distinguishing characteristics of the high rating Montessori teacher (I) finds that the data provide some insights about teacher behavior styles which facilitate the development of these particular cognitive orientations.

A distinctive feature of the Montessori I teacher's approach was her habit of questioning children so as to stimulate them to explore alternatives, thereby encouraging a divergent response set. This aspect of her behavior would seem to be especially relevant for the development of innovative problem-solving strategies, and is consistent with the pronounced difference between the two Montessori groups in this assessment area (Teacher differences were most significant on the test of Innovative Behavior.)

Another characteristic noted for this teacher was her skill in utilizing the spontaneous interest cues of the children as an instructional guide, and adapting her guidance techniques with the didactic materials. Consequently, her instructional interactions were genuinely child-centered and managed to capitalize on the learning potential implicit in a child's activity pattern. This teacher factor should operate to enhance task persistence, involvement, and concentration, and probably was largely responsible for the higher Persistence scores and Task Competence ratings of her pupils.

Furthermore, this teacher displayed a more consistently firm management style, characterized by more clearcut and explicit standards for pupil behavior -- in which respect she would seem to have provided a sound socialization model for the development of a strong task orientation and the motoric impulsivity control which this implies in a Montessori classroom.

In these specific respects, and overall, the Montessori I teacher was considered by the Montessori consultant, observers, and the investigator, to be more adept than her colleague at translating the spirit of

Montessori philosophy into classroom practice. She was also the better trained of the two instructors, as well as more experienced in the classroom (her colleague being a novice at teaching). And as important, she espoused a firmer professional commitment to a Montessori point of view.

Bearing in mind these teacher differences, the research evidence suggests that we may expect more positive training outcomes from Montessori instruction when the teacher qualifies in these specific terms. In sum, the more positive training effects indicated for the Montessori I approach imply a teacher who has internalized the spirit of Montessori's approach to the child; and is capable of implementing it in the classroom, beyond mastery of the prescribed instructional techniques. On the other hand, the data indicates these teacher qualities to be less important in promoting a spontaneous, exploratory problem-solving set than a permissive, loose management style. For the neophyte Montessori II teacher, who typified this stance, obtained higher mean group scores on both of the relevant (unstructured) tasks, showing to better advantage particularly on the Curiosity measure.

Findings for the Four Year Olds

The assessment measures also showed differentiation of experimentals and controls for the younger age entrants, although the overall probabilities on the test battery were slightly lower than those obtaining for the five year olds. What is striking about these results, summarized in Table II-6, is that the significant differences here favored the controls predominantly, with a negative Montessori trend obtaining in five of the nine assessment areas (these probability figures ranging from the -.0005 to the .-15 level of significance). But this assessment picture is actually less indicative of an age differential in training effects, than it is of sampling and treatment factors peculiar to the younger Montessori sample. When these factors are taken into account, it is apparent that the negative experimental effect obtained at this age level is basically a reflection of sampling and treatment considerations specific to the younger experimentals.

The Montessori classes here included several children labelled "immature," "disruptive," "difficult to manage" by their teachers, as well as the educational director of the center and the Montessori consultant. This sample characteristic distinguished the younger experimentals from both the older experimentals and the younger controls (where no specific youngsters were identified as problem children). As a result of this situation, the two Montessori teachers tended to moderate their expectations and demands for pupil self-reliance and achievement with this age group, and to adopt a policy of containment. (Their goals for these youngsters were mainly to keep them occupied and prevent them from disturbing class routines.)

TABLE II-6[a]

MEAN ACHIEVEMENT SCORES FOR EXPERIMENTAL AND CONTROLS (FOUR YEAR OLDS)

	Area	Mont. I	Mont. II	Control	Overall Probability
Unstructured Tasks	Task Initiation				
	Mean	2.7	2.3	1.6	
	Median	3.0	2	1	.03
	Range	1-4	1-4	1-4	
	Curiosity				
	Mean	20	18	14.7	
	Median	21	17	13	.10
	Range	17-22	10-28	0-27	
Structured Tasks	Motor Impulse Control[b]				
	Mean	.75	.82	.62	
	Median	.91	.72	.59	-.015
	Range	.32-1.03	.48-1.37	.47-.80	
	Reflectivity (MFT)				
	Mean	5	5	6.83	
	Median	5	4.5	6.5	-.0005
	Range	4-6	4-7	6-8	
	Innovation				
	Mean	1.67	3.5	3.3	
	Median	2	4.5	1.5	-.15
	Range	0-3	0-7	1-12	
	Field Independence (EFT)				
	Mean	10.7	11.3	11.5	
	Median	13	11	12	-.15
	Range	6-13	6-17	8-15	
	Persistence				
	Mean	7.3	9.5	9.2	
	Median	8	9.5	11.5	.99
	Range	5-9	5-11	2-12	
Rating Scales	Task Competence				
	Mean	10.7	10	11.2	
	Median	10	11.5	12	-.09
	Range	9-13	5-12	7-14	
	Social Competence				
	Mean	14	13	12.8	
	Median	15	13	13	.13
	Range	11-16	12-14	10-16	

[a] A negative significance indicates C>M.

[b] On this test, lower score is indicative of higher achievement; i.e., better control of impulsivity.

For the most part these teachers concentrated on instructing the older children, letting the aides assume more responsibility for the supervision of the younger ones. In these respects the psychological climate of the Montessori milieus for the younger children was atypical, and represented a departure from teacher practices with the older children in the community center classes. These were therefore altered Montessori environments, typifying reduced teacher expectations for self-regulation and industry, and limited teacher intervention. Whereas the control setting was comparatively more directive, and involved more formal instruction for the younger pupils. Consequently, we would predict for this age group on the basis of outcomes in the five year old samples: 1. a reduction of Montessori's positive impact on the structured task variables, 2. very possibly, an increase in the positive experimental effect on the two unstructured tasks.

And indeed, these predictions were substantiated by the pattern of findings in Table II-6. Inspection of this table reveals negative probabilities favoring the controls on all of the structured task variables (Motor Impulse Control, Reflectivity, Innovation, Field Independence and Task Persistence). And the data shows a pro-Montessori trend on both Task Initiation and Curiosity, with these differences in fact discriminating at the .03 and .10 levels of significance for the younger children. The fact that these two measurements discriminated significantly only at this age level may be argued to validate empirically the explanation of treatment outcomes for the younger children in terms of pupil characteristics and teacher practices on the following grounds.

In the first place, the immaturity of the younger Montessori subjects should strengthen their predilection for a spontaneous exploratory set.

In the second place, the comparatively diluted and more non-directive Montessori approach with younger pupils would be more in line with, and consequently more supportive of this cognitive approach to the environment, but by the same token less effective in developing a firm pupil task orientation.

Additional findings further buttress an explanation of treatment trends in this age group in terms of sample characteristics and treatment considerations prevailing for the younger experimentals.

The Extreme Differences Obtaining on the Reflectivity Test. A review of the probability figures in Table II-6 indicated this assessment measure to be the most sharply discriminating, yielding an overall p. of -.0005. It was in fact the only measurement which discriminated significantly for each Montessori teacher as compared to the control, with these two teacher comparisons discriminating at the .03 and .02 levels of significance. The more extreme differences emergent here strongly suggested that a sampling factor was operant. For the notably less reflective style of the younger experimentals is highly consistent with the picture of immaturity which they presented. The fact that they were described as problem children by teachers implies poorly developed controls and little inclination in the direction of thoughtful, considered response styles. Insofar as the Montessori pupils' poorer performance on the Reflectivity test empirically validated their classroom behavior pattern, the extreme differentiation in this assessment area certainly suggests the impact of pupil factors on evaluation outcomes.

The Highly Significant Differences on the Test of Motor Impulse Control. This rationale is also supported by the finding that Motoric Impulse Control was the second most discriminating measure in the battery, with a p. of .015 favoring the controls. The poor performance of the experimentals on this test is consistent with their poor showing on the Reflectivity test, and also suggests immaturity in view of the fact that -- the type of child who is reported to be "immature" and troublesome, usually tends to be hyper-active and has difficulty controlling the motoric overflow.

Teacher Trends. Pupil test profiles for the two Montessori teachers further highlight the importance of sampling and treatment factors. These teacher comparisons indicated the Montessori II teacher to consistently rate higher on the structured task measures, with the exception of a teacher tie in mean scores on the Reflectivity test. However, she was the low rating teacher on both Task Initiation and Curiosity. These teacher trends were the reverse of teacher trends in the five year old sample, which favored the Montessori I teacher on the structured tasks and the Montessori II teacher on the two unstructured tasks. The significance of this finding becomes clear when we take into account the following considerations.

In the first place, the Montessori I teacher experienced greater difficulty with the management of her younger pupils, who were reportedly more immature and unsettled than the four year olds in the Montessori II group (according to feedback from all three community center teachers as well as the Montessori consultant). In the second place, this teacher's stance with her younger pupils contrasted quite sharply with her approach to the five year olds, by way of diminished teaching effort and reduced demands, and a considerably more permissive management style (in which respect her behavior towards the four year olds represented a more extreme departure from her usual modus operandi than was the case with the Montessori II teacher). Bearing these factors in mind, the reversed teacher trends here, showing poorer performance for the Montessori I group on the structured task variables and more positive outcomes regarding the ambiguous task measures, seem to be chiefly attributable to the immaturity of these youngsters and teacher coping styles.

In summing up the implications of these findings, it can be stated that the analysis of trends for the younger age entrants confirms expectations based on the results for the older children in this investigation, as well as the public school sample. Thus, despite the divergent pattern of directionality at each age level investigated in this study, we find training outcomes for the four year olds to be dynamically congruent with, and in this sense supportive of, training trends for the five year olds.

-

Notwithstanding differences between the Montessori and conventional teaching prototypes in this study and the preceding investigation -- the results for the five year old community center sample were basically in agreement with the public school findings in discriminating significantly between the older experimentals and controls, and demonstrating more favorable training outcomes for Montessori teaching. Insofar as the training picture for these older age entrants was consistently pro-

Montessori, the data supported all of the hypotheses specifying more favorable outcomes for this approach. However, results here did not support the prediction that conventional training would be more productive of autonomy by way of promoting a more spontaneous exploratory problem-solving set. (Trends in this assessment area were non-significant, and actually more reflective of teacher differences within treatments than between treatment differences.)

On the basis of these findings for the five year olds, we would expect more autonomous cognitive characteristics for Montessori trained children of this age, given similar classroom prototypes -- i.e., quite flexible and fairly free-wheeling Montessori teacher style as compared to a control model departing from the usual conventional approach, in terms of a strong achievement press and considerable formal structured teaching activity. However, it must be stated that there were significant differences in the classroom impact of the two Montessori teachers, whose respective group profiles on the assessment battery showed differing patterns of strengths and weaknesses. In light of the fact that these teacher trends predominantly favored the more experienced and skillful of the two instructors, the prediction of more positive training effects for Montessori teaching as compared with conventional approaches implies an adept Montessori practitioner.

In contrast to the training picture at this age level, results for the four year olds discriminated largely in favor of the controls, due to pupil characteristics and differing teacher strategies in the younger Montessori subsample. As a consequence of these factors, the research findings revealed the Montessori teacher prototypes investigated to be less effective in reinforcing autonomous cognitive orientations at the younger age level.

CHAPTER 11

A SUMMARY OF TRAINING EFFECTS

An Overview of the Two Investigations

The outcomes of this assessment supported the hypothesis that Montessori and conventionally trained children would differ significantly in terms of cognitive styles having relevance for autonomous problem-solving strategies. Results for the older children, beginning training at four years of age, showed considerable differentiation of experimentals and controls on the test battery. In the public school, 5/9 of the assessment measures, and in the community center, 7/9 of these measurements discriminated significantly at this age level, yielding probabilities in the .01-.09 range, and attaining the .01-.05 level in most instances.

Research findings for the four year old entrants consistently indicated Montessori teaching to be significantly more reinforcing than conventional teaching of Motor Impulse Control, a Field Independent analytic style, and Task Persistence, in line with differences hypothesized. The uniformity of these treatment trends across two independent investigations specifies these cognitive outcomes to be major strengths of the Montessori model. Insofar as these particular orientations are relevant for school achievement, Montessori teaching appears to be more productive of cognitive sets appropriate for classroom learning.

In the light of these findings, the research documents the positive impact of instructional procedures, which are highly demanding and rewarding of children's efforts to achieve motor coordination and control, a perceptual analytic set and a strong task commitment. For these are all highly visible features of a typical Montessori classroom press, where both basic task demands and the sanction of teacher approval/disapproval consistently encourage and reward these behavior styles, as well as independence and self-regulation.

Results for this age group also bore out the hypotheses that the Montessori trained children would demonstrate greater efficiency in dealing with structured problem-solving situations as well as a more affirmative ego stance in response to cognitive achievement challenges. (In this connection, examiner ratings characterized the Montessori samples as showing more confidence and self-reliance and less need for extrinsic reinforcements of praise and reassurance in the testing situation.) The uniformity of these trends substantiates the underlying rationales generating these hypotheses. In the first place, the superior performance of the Montessori pupils in structured task contexts is consistent with the premise that a prekindergarten environment, stressing highly structured types of task routines, should be especially reinforcing of this kind of learning set. In the second place, the fact that the Montessori subjects obtained higher ratings of poise and confidence in the testing situation validates the assumption that a training environment should be highly encouraging of a self-reliant and intrinsically sustained achievement set, when the learning climate affords the child a continuing succession of mastery experiences and a resultant sense of his own potential for accomplishment. (Confirmation of the child's capacity for learning and achievement are built into the Montessori classroom press by virtue of the immediate and non-evaluative feedback to the learner and the sequenced progression of challenges which the training materials provide -- as well as the very positive teacher expectations for accomplishment and the supportive guidance techniques which distinguish good Montessori teaching.)

We did not find comparable systematic and/or significant treatment effects in the remaining assessment areas, where the data either failed to show uniform directional trends or significant mean score differences in the two investigations.

However, there was a consistent pattern of interaction effects between individual teacher styles and pupil outcomes relating to spontaneous exploratory tendencies in ambiguous, unstructured problem-solving situations. In both the public school and the community center, children's response patterns in these task contexts showed initiation of exploratory activity and curiosity, especially, to be negatively related to mechanistic instructional styles. The emergence of this trend across two investigations indicates training technology per se to be a less significant factor in shaping these cognitive orientations than the individual teacher's transactional style. Thus the indications are that the flavor of the teacher-child transactions is a crucial factor to be considered in evaluating the effects of any prekindergarten model from this standpoint. Certainly, in planning for the constricted youngster, who needs to loosen up, this would also be an important consideration in determining the appropriateness of classroom training procedures, in the case of Montessori or contrast prekindergarten models.

In summing up the findings for children entering the prekindergarten at four years of age, it can be stated that these assessment areas were the most discriminating of training effects at this age and stage of schooling, as well as differences in cognitive style outcomes of Montessori and conventional teaching approaches.

Differential treatment effects were also evident for the younger children entering the prekindergarten at three years of age, although at this age level, differences between experimentals and controls on the cognitive style battery were slighter, with probabilities chiefly in the .09-.15 range. The most distinctive feature of the performance profiles for these younger entrants, however, was a reversal of the directional trends obtaining for the older children, due to modification of Montessori treatment procedures with younger pupils.[1] In this case, results predominantly favored the controls, as a consequence of the altered teaching set of the two Montessori instructors with the younger children.

Analysis of these teachers' strategies of dealing with the three year old entrants indicated their diminished effectiveness here to be associated with a basic shift in teaching style, in the direction of: reduced demands for industry, responsibility, and self-regulation; and overall, a more laissez-faire permissive policy. Thereby, the Montessori model assumed a more "traditional" classroom tone, in comparison with the control environment. The latter was actually more demanding in these respects, since this control teacher did not basically alter her style with younger pupils, and was an unusually firm taskmaster to begin with. In this sense, the control environment could be said to depart from the usual conventional model and to connote something of a Montessori flavor.

---

[1] Treatment procedures here were complicated by the presence of a high proportion of immature younger children in the Montessori classes, who posed management problems for both of the community center Montessori teachers. Their moderated approach to these children represented an attempt to cope with this situation.

Results showed negative experimental effects to be salient in the areas of Motoric Impulse Control, Reflectivity, Field Independence, Innovation, and Task Competence, where the younger controls did significantly better. These findings suggest that, when Montessori teaching departs from the usual model in the directions specified, we can expect it to be less reinforcing of these cognitive orientations, and overall, of efficiency in dealing with structured types of problems -- though more productive of spontaneous exploratory tendencies and curiosity in unstructured problem-solving situations. (In these assessment areas, the younger Montessori pupils did significantly better.) Insofar as these expectations were also substantiated by teacher styles and training outcomes for the older sample, the data for the two age groups were mutually supportive, although directional trends did not concur.

In view of the treatment variation for younger and older children, the data precludes drawing conclusions about comparative training effects for the two age levels investigated. Nevertheless, the age comparisons were illuminating from the following standpoints. For one thing, these results highlight the quality and flavor of prekindergarten teaching strategies over and above specific instructional procedures, and the resultant psychological impact on cognitive style patterning. For another, they dramatize the point that the classroom climate may exert a differing psychological press for children in the same class, approximating in this respect, the varied socialization press of the parental climate for siblings in the same family. This aspect is significant in terms of its classroom learning implications, particularly for youngsters who are disadvantaged in terms of negative teacher perceptions. And it is by no means an irrelevant consideration for the researcher investigating learning outcomes.

Performance patterns on this test battery paralleled results on the measurements of perceptual and cognitive abilities with respect to age, sex, and ethnicity trends. Here too, the data showed a systematic age differential favoring the older children, who did better on 16/21 comparisons (excluding the examiner rating scales). Not surprisingly, in these comparisons, the younger children consistently displayed greater capacity for spontaneity in ambiguous problem-solving contexts, where this cognitive set was appropriate -- a finding in line with the developmental trend toward increasing inhibitory controls.

No comparable sex or ethnic differentials obtained here, although girls tended to do slightly better than boys on the measurements of Field Independence/Perceptual Differentiation and Task Persistence, and the Task Competence ratings.

When we consider the results of this assessment in relation to the perceptual and cognitive achievement outcomes summarized in Part I of this report, it is clearly apparent that the Montessori and traditionally taught children in our sample differed more in terms of cognitive style patterning than in terms of perceptual and cognitive achievement levels. For in the latter assessment areas, differences between the two groups were modest, and significant chiefly on a consistency basis (with absolute performance differentials discriminating chiefly for the low achievers). Whereas the cognitive style measurements discriminated on a magnitude basis across the board. Thus an overview of training effects obtaining in each stage of this investigation warrants the final conclusion that Montessori and conventional teaching models differ primarily in terms of the psychological impact of classroom conditioning on learner styles and to a lesser extent in terms of achievement impact on specific skills.

PART III

A FOLLOW-UP STUDY OF TRAINING EFFECTS AT THE END OF KINDERGARTEN

Chapter Page

12 THE RESEARCH PROBLEM AND DESIGN. 95

Introduction. 95

Research Design 95

Experimental Procedures 97

Sample. 97

Instrumentation and Assessment Procedures 98

13 CLASSROOM PROFILES 101

The Montessori Prototype. 101

The Control Prototype 102

14 RESULTS OF THE ASSESSMENT. 105

Reading Readiness 105

Visual Perception 108

Impulsivity and Reflectivity. 109

Intellectual Functioning. 111

15 SUMMARY. 112

CHAPTER 12

THE RESEARCH PROBLEM AND DESIGN

Introduction

In order to investigate the cumulative effects of training over a longer period of schooling, including a year each of prekindergarten and kindergarten training, a follow-up assessment was conducted at the end of kindergarten. The purpose of this investigation was to compare Montessori and conventional teaching outcomes specifically with respect to visual perceptual development, reading readiness, impulsivity/reflectivity, and IQ change.

The hypothesis under investigation was that children exposed to Montessori prekindergarten and kindergarten training would demonstrate superior perceptual and prereading skills as compared with children undergoing conventional training. This hypothesis was predicated on the assumption that certain distinguishing features of Montessori practice would enhance development in these directions. These were: 1. the heavy loading of perceptual discrimination training and the systematic introduction of prereading acitivites; 2. the continuity of achievement stimulation and consistent reinforcement for accomplishment in Montessori classrooms, and the resultant impact of these press factors on achievement motivation and the development of a positive learning set.

Research Design

The design of this follow-up study, in contrast to the first year assessment, was limited to one comparison study of children undergoing

Montessori and conventional treatments, involving only the public school experimental and control classes from the first year sample.

During the second year of training, pupils were regrouped. In the case of both experimentals and controls, children formerly coming in the afternoon were reassigned to the morning classes, thereby combining a.m. and p.m. classes into a single session. (Class size in each instance was limited to 25 children, including a few new pupils not included in our sample.)

In the case of the experimentals, the same teacher was retained for the two years, paralleling the usual Montessori school setup. However, the controls were exposed to two different teachers during the two year period, in line with conventional treatment procedures. On the one hand, this teacher variable may be considered a limitation of the design insofar as we cannot parcel out its influence on the assessment outcomes. On the other, it can also be argued that prolonged pupil exposure to the same teacher for several years is a basic of Montessori practice; and that therefore, a realistic appraisal of long-range effects should replicate this angle. Furthermore, it is also probable that the academic learning outcomes under investigation here are less likely to be contingent upon teacher stability than might be the case were the focus of this evaluation upon psychological effects of training. With the exception of this design variant, the treatment situation in the two classrooms was comparable in that sample parameters were equivalent in each instance as well as experimental procedures.

Experimental Procedures

The research plan did not include any special intervention procedures on the part of the investigator. Rather, the two teachers, neither of whom was a neophyte at teaching or new to the school, were free to implement their respective curriculums as they saw fit. However, each was requested to submit a monthly teaching log for two three-month periods during the year as a means of providing feedback on program content and instructional procedures. And teaching routines were periodically observed in each classroom (classroom observations involving independent observations by the investigator and the project assistants).

Both teachers were allotted a special fund for the purchase of instructional materials according to the dictates of their professional preferences.

Sample

Table III-1 summarizes the basic characteristics of the public school sample, consisting of 43 Puerto Rican and Negro children from the low income bracket, enrolled in Headstart the preceding year.

TABLE III-1

SAMPLE CHARACTERISTICS

	Experimentals	Controls
Age Range	5-6 - 6.6	5.7 - 6.6
Mean Age	6.0	6.0
IQ Range	54 - 116	63 - 110
Mean IQ	82.9	84.5
Boys	8	12
Girls	13	10
Puerto Ricans	10	11
Negroes	11	11
Total N	21	22

Instrumentation and Assessment Procedures

The assessment battery was designed to evaluate specific aspects of cognitive functioning, which have been found to be positively related to reading achievement in the first grade: visual-perceptual development, reading readiness skills, reflectivity/impulsivity. The measurements employed were the following:

1. Frostig Developmental Test of Visual Perception. Four subtests were used to assess eye-motor coordination, figure-ground differentiation, spatial discrimination and grasp of space relationships.

2. A Group Kindergarten Reading Readiness Test. This measure had been previously developed at the Center for Urban Education in conjunction with an experimental reading project and included parts of various standardized measures. It comprised the following subtests:

(a) Object Recognition

- Simple. Child identifies object named from a pictorial object series.
- Complex. Here the task is similar but more demanding. The stimulus material is more complex, involving a series of action pictures rather than simple objects.

(b) Visual Discrimination of Similarities and Differences

- Alphabet letter matching. Examiner shows a stimulus letter and child must select the matching letter from a pictorial series.
- Word matching. Same type of test using words instead of alphabet letters.
- Identifying the word that is different. Child must select the word that is different from the stimulus word.

(c) Auditory Discrimination of Likenesses and Differences

- Demonstrating ability to discriminate between like sounding words with similar phonetic elements. Examiner pronounces a series of word pairs, specifying in each instance the stimulus word. Child must then select from a pictorial series the picture corresponding to this stimulus word.

(d) Story Comprehension

- Examiner reads a short story unit and child demonstrates comprehension by selecting the content appropriate picture from a series.

3. Kagan's Reflectivity/Impulsivity Test (the kindergarten/primary version of this test). This measurement assesses reflectivity in terms of perceptual differentiation ability. It requires fine visual discriminations of likenesses and differences, requiring the child to select from a series of very slightly dissimilar drawings the one that matches the stimulus drawing. Seven of the Kagan drawings were selected for our sample. The two least difficult drawings were presented as warm-up and practice items, and the remaining five comprised the actual testing sequence (lamp, boat, baby, cowboy, bed).[1]

4. The Stanford-Binet Intelligence Test: Form L-M. The assessment battery was administered during the final month of school by a skilled examiner familiar to the children, who had also conducted a major portion of the testing the preceding year. All measurements were given individually, with the exception of the group reading readiness test, which was given in the classroom during three separate sessions.

---

[1] Level of difficulty of these drawings was established on the basis of pre-testing with another kindergarten class in the school, which was not involved in this study.

CHAPTER 13

CLASSROOM PROFILES

The Montessori Prototype

This teacher's style of implementing Montessori practices typified a highly structured, organized, and precise teaching model, both in terms of instructional techniques with the training materials and definition of work routines.

The instructional pattern was one of individualized teacher guidance and small group structured teaching activities during the free play/work period, followed up by a large group activity. The teacher's questions to the children reflected a high degree of logical organization in leading up to the main point of the lesson. Both the children and the teacher approached the task of learning seriously -- the class striving to gain her approval through mastery of the training activities. Overall, the tone of the instructional transactions was quite adult, and the teacher's treatment of pupils respectful and mature (there was no babying in this classroom). Her confidence in their learning potential was explicitly apparent in her continuing efforts to challenge them.

With respect to curriculum content and method, the teaching logs revealed a pervasive and organized oral language training thrust by way of: 1. systematic teacher efforts to develop auditory awareness and discrimination of letter sounds and words through varied channels (games, structured group exercises, poetry, having children tape recitation of poems and sentences); and 2. pupil practice in listening to stories and retelling them, with emphasis on the sequence of events, main ideas, beginning and ending of story. Pre-writing and pre-reading activities were also an integral part of this program (tracing letters, learning their sounds, associating written words with objects and actions, learning initial consonant sounds, having pupils dictate stories, copy them into booklets and read them with the teacher's help). This teacher also specifically worked on getting the children to express themselves in full sentences. From a learning standpoint, the Montessori environment was more challenging than the control environment in these respects; and provided more stimulation too in terms of instructional procedures. (In the Montessori classroom, the instruction more often approximated a sequential progression from simpler to more complex learning tasks.)

The general atmosphere of this classroom was orderly but lively. This was a place where everyone was usually busily engaged, primarily in prescribed training tasks. Overall, the psychological tone was more relaxed and informal than it had been the year before. There were concrete indications that the teacher had loosened up a good deal. She was more able to adapt herself to the rhythm of the group, and to encourage self-direction on the part of the children. Peer group interaction patterns too reflected this change, in terms of increased conversation between children and more sociable and less solitary work patterns. And a growing sense of mutual trust and understanding between teacher and children was apparent to the observer.

The Control Prototype

The control classroom was quite typical of conventional kindergartens from the standpoint of the physical environment, the activities in which the children engaged, and the general pattern of teacher guidance. The atmosphere here was essentially a free-wheeling situation where the children spent most of their time in free-play activities, with a minimum of teacher intervention -- in contrast to the pronounced task orientation in the Montessori class and the active instructional role of the Montessori teacher throughout the morning. By comparison, the classroom format here involved little exchange of information between teacher and children during the free-play period, when the control teacher's role was principally one of maintaining order, providing materials, and giving approval, rather than actively teaching. Thus, the control youngsters received a minimum of individualized guidance, the backbone of the Montessori curriculum.

The activity choices in this classroom were traditional, including opportunity for construction and dramatic play with blocks, art work, fantasy play in the dollhouse corner, and working with standard cognitive stimulation materials. Formal instructional efforts (mainly large group lessons), were centered around development of oral language skills, and included science activities, instruction in number and quantity concepts, and some practice in making perceptual discriminations. Although the control curriculum resembled the Montessori model in terms of general content coverage, it differed notably in a number of respects.

Oral language training here was directed more toward stimulating pupil conversation than on developing specific skills, and revolved chiefly around group discussions of stories read to the class and current interest topics. Pre-reading skills were minimally emphasized, and instruction in this connection consisted mainly of introducing alphabet and letter sounds. Nor did the control curriculum match the Montessori model in terms of tactile and kinesthetic sensitivity training, which was considerable in the Montessori classroom. On the whole, the control teaching effort was a good deal more informal, much less structured and sequenced, and comparatively lacking in sophistication. By and large, it did not afford comparable challenge by way of exploiting the pupils' abilities fully or keeping their interest high, largely as a result of teacher presentations which were too simple and minimally demanding.

The learning press here also differed in terms of its psychological tone. Overall, classroom management techniques, in contrast to the Montessori model, seemed less effective in setting the stage for responsible, mature pupil behavior patterns. This was particularly evident, for example, during transitional activity periods, where the teacher found it necessary to continually exhort and order the children to be quiet and settle down. Though very friendly, warm, and informal in dealing with pupils, this teacher's basic posture was less conducive to internal self-regulation on the part of the children and geared more to securing their compliance with her demands.

CHAPTER 14

RESULTS OF THE ASSESSMENT

Reading Readiness

The reading readiness test profiles (Table III-2) favored the Montessori sample, although differences between experimentals and controls were not extensive on this measure. The major differences between them emerged in relation to Auditory Discrimination (words) and Story Comprehension, with the former subtest discriminating at the .003 level of significance and the latter at the .004 level.

The Montessori group also did a little better on two additional subtests, Complex Object Identification and Auditory Discrimination (consonants), although the probability figures in each instance attained only the .08-.09 level of significance. The controls did significantly better in one assessment area only; namely, Simple Object Identification, where results discriminated in their favor with a p. of .035.

The substantial advantage indicated for the Montessori pupils with respect to Story Comprehension and Auditory Discrimination skills is not surprising, and even predictable, given this Montessori teacher's efforts and instructional emphases in these areas (noted in the classroom profile descriptions, Chapter 13). From this standpoint, the data served to highlight the obvious truth that children are indeed most likely to learn precisely what they are taught. While generalization about training outcomes is necessarily limited with only one set of classroom comparisons -- the data does point up the fact that a highly organized and systematic approach to teaching oral language and auditory discrimination skills in the kindergarten can be expected to pay off for the Headstart youngster, typically weak in these respects, and more so than a relatively loosely structured and informal training effort.

As far as the non-significant trends favoring the controls are concerned, their higher mean scores on Visual Similarities and Visual Differences (alphabet letters) were consistent with the control teacher's efforts in conjunction with pre-reading skills development. For her formal teaching in this respect consisted chiefly of training the children to recognize the alphabet letters, an obvious advantage on these two subtests. It is more difficult however to explain the superior performance of the controls on the Simple Object Identification subtest in terms of classroom learning activities, since no clear relationship is apparent to the writer.

TABLE III-2

MEAN ACHIEVEMENT LEVELS FOR EXPERIMENTALS AND CONTROLS ON THE READING TEST

Area	Montessori	Control	Results Direction	 Sig. Level
SIMPLE OBJECT IDENTIFICATION				
Mean	6.7	7.6	C>M	.035
Median	7.0	8.0		
Range	1-9	4-9		
COMPLEX OBJECT IDENTIFICATION				
Mean	8.7	8.3	M>C	.096
Median	9.5	8.5		
Range	4-10	4-10		
VISUAL SIMILARITIES (Alphabet Letters)				
Mean	5.9	6.7	C>M	.12
Median	7.0	7.0		
Range	1-7	3-8		
AUDITORY DISCRIMINATION (Words)				
Mean	12.2	10.4	M>C	.003
Median	12.0	11.0		
Range	7-14	5-14		
VISUAL DIFFERENCES (Alphabet Letters)				
Mean	6.8	7.3	C>M	.46
Median	8.0	8.0		
Range	0-9	0-9		
STORY COMPREHENSION				
Mean	5.2	3.6	M>C	.004
Median	6.0	3.0		
Range	1-8	1-7		
VISUAL SIMILARITIES (Words)				
Mean	4.8	4.7	M>C	.38
Median	5.0	4.5		
Range	1-8	1-8		
AUDITORY DISCRIMINATION (Initial Consonants)				
Mean	6.4	5.8	M>C	.08
Median	7.0	6.0		
Range	2-10	1-10		
VISUAL DIFFERENCES (Words)				
Mean	5.9	5.8	M>C	.50
Median	7.5	6.5		
Range	0-9	1-10		
TOTAL SCORE				
Mean	62.4	60.2	M>C	.35
Median	66.0	62.5		
Range	20-80	39-75		

Visual Perception

The Frostig test (Table III-3) showed some differentiation of experimentals and controls in two of the perceptual areas assessed. These were Eye Motor Coordination discriminating at the .04 level, and Figure Ground Differentiation discriminating at the .08 level of significance. Differences in each instance favored the Montessori sample, in line with perceptual outcomes of the first year assessment where the trend was similarly pro-Montessori.

Since the Frostig test provides normative data based on the performance of 2,116 unselected school children at nursery school, kindergarten, first, second and third grade level, it is possible to compare the achievement levels of our sample with the general population. Conversion of raw scores into perceptual age equivalents, based on the Frostig norms, indicates the Montessori pupils performed as well as the average six year old on Eye-Motor Coordination and even did a little better (exceeding the six year norm by three months).[1] The controls achieved a perceptual age equivalent of only five years and nine months. On the remaining Frostig subtests, neither the Montessori pupils nor the controls did as well, with both groups achieving below the average for their age, and more closely approximating the test profiles of five year old children.

In the particular skills measured on this test the entire public school sample achieved slightly below their age level in comparison to the general population, with the exception of Eye-Motor Coordination ability, where the Montessori regime succeeded in upgrading achievement to the level of the national norms.

---

[1] Mean age of both experimental and control classes was six years.

TABLE III-3

MEAN ACHIEVEMENT LEVELS FOR EXPERIMENTALS AND CONTROLS
ON THE FROSTIG TEST OF VISUAL PERCEPTION

			Results	
Area	Montessori	Control	Direction	Significance Level
EYE-MOTOR				
Mean	12.9	10.3	M>C	.04
Median	12.0	10.5		
Range	7-22	0-17		
FIGURE-GROUND				
Mean	11.1	9.1	M>C	.08
Median	10.0	9.0		
Range	2-20	3-18		
POSITION IN SPACE				
Mean	3.9	3.2	M>C	.50
Median	3.0	3.0		
Range	1-8	1-5		
SPATIAL-RELATION				
Mean	1.9	2.0	C>M	.31
Median	2.0	2.0		
Range	0-6	0-5		
TOTAL SCORE				
Mean	29.7	24.6	M>C	.14
Median	29.0	22.0		
Range	13-51	10-44		

Impulsivity and Reflectivity

The two groups were compared with respect to the proportion of children whose performance on this test identified them as impulsive or reflective. In line with Kagan's scoring method for this test, the procedure for making these comparisons was the following: children were labeled _impulsive_ when their latency scores fell below the median for our population and their error scores exceeded the median; children were identified as _reflective_ when their latency scores exceeded the median for our population and their error scores fell below the median. The results of this comparison revealed roughly comparable proportions of reflective and impulsive pupils for experimentals and controls.

Performance patterns were then compared from a different angle, looking at results in terms of their perceptual implications of capacity for making fine visual discriminations of likenesses and differences (basing group comparisons solely on achievement scores). Achievement qua achievement on this test is a good diagnostic indication of this capacity, since correct responses demand accuracy in making such discriminations. Therefore, the two groups were compared solely with respect to mean achievement scores, ignoring response latency (mean achievement scores here representing the number of successes on the five drawings comprising the testing sequence). Results of this analysis showed superior visual discrimination of likenesses and differences for the Montessori subjects, with achievement scores discriminating in this direction at the .006 level of significance.

In view of this finding, the Montessori model appears to be a more promising strategy for developing a perceptual discriminatory set for likenesses and differences. The data in this respect provided some support for related theoretical speculations advanced by the investigator prior to this study (Berger-R5). Considering that Montessori as compared with conventional classrooms typically provides much more extensive practice in discriminating visual similarities and differences (by way of the sensorial training materials and the instructional sequences prescribed for them), the trend emergent here seems quite likely to hold up in future replications.

Intellectual Functioning

Approximately half of the experimental and control samples were retested on the Stanford Binet, form LM (subjects retested included only those children who were originally tested in English during the first month of the prekindergarten). Comparisons of median IQ gain for the two groups indicated roughly comparable gains for the two year training period (a median gain of 12 points for the Montessori group and 15.3 points for the controls). An analysis of variance revealed significant pre-post treatment gains for both experimentals and controls, but no significant main treatment effects or interaction. Thus outcomes in this study did not indicate the Montessori and conventional treatments to differ appreciably in terms of their impact on IQ performance, in contrast to the other assessment areas, where some differential effects of training were apparent.

CHAPTER 15

SUMMARY

The follow-up assessment based on two years of training showed some clear-cut treatment trends favoring Montessori teaching. The Montessori sample was superior with respect to certain reading readiness skills and some areas of perceptual functioning. No significant differences emerged on the measure of impulsivity/reflectivity or in relation to IQ. (Both groups showed comparable median gains with respect to pre- and posttest scores on the Stanford-Binet.)

To what extent the better showing of the Montessori sample on the reading readiness test warrants a prediction of comparable outcomes in future comparison studies is, however, questionable. Generalization is limited by the fact that the Montessori teacher participating in this investigation emphasized the particular prereading areas where significant differences favoring her group obtained. (These areas were auditory discrimination and story comprehension.) Moreover, her training emphases is these reading readiness areas were largely attributable to her own resourcefulness and competence rather than to prescribed Montessori training procedures. The formal Montessori kindergarten curriculum does not provide very precise teacher guidelines for training in either auditory discrimination or oral language skills.

The positive impact of Montessori training on perceptual functioning was most notable with respect to differences in the discriminatory set for visual similarities and differences, with the data discriminating in this direction at the .006 level of significance. There was also a highly significant difference favoring the Montessori sample in the area of eye-motor coordination, .04, as well as a definitive pro-Montessori trend in the area of figure-ground differentiation (with differences here approaching significance at the .08 level). The more favorable Montessori outcomes in these assessment areas generate more confidence in predicting similar results in future replications when we consider that: teacher practices relative to perceptual learning activities were fairly standard for well trained Montessori teachers; and pupil outcomes were consistent with short term trends obtaining in the first year assessment. (These showed superior performance for the Montessori trained children on the perceptual discrimination measures and the embedded figures test.)

In summing up the cumulative effects of training on visual perception, it was apparent that differences between experimentals and controls were a good deal more salient at the end of the two year training period than was the case at the end of the first year of schooling. (At the end of the first year, the perceptual assessment measures discriminated chiefly for the poor perceptual achievers, whereas differences specified in the follow-up study discriminated for the total sample.) Insofar as these short and long term comparisons indicate more pronounced treatment effects over time, the research findings document the value of longitudinal assessment designs in evaluation studies of early childhood training practices.

One other point of difference between the experimentals and controls seems to be deserving of mention. This was a marked differential in pupil response set during the testing session. Feedback from the examiner specified the Montessori pupils as considerably more able than the controls to settle down, pay attention, and comply with task procedures and routines during the group administration of the reading test. Difficulties along these lines were, in fact, encountered in the control testing session and required individual retests for a few children, but did not occur in the Montessori class.

In sum, the research indications are that Montessori teaching has greater potential for accelerating reading readiness, visual-perceptual functioning, and an attentive work set, where the Headstart child is concerned (presuming, of course, Montessori and conventional teaching models comparable to the public school prototypes, and in each instance, similar instructional emphases).

Regrettably, this follow-up assessment did not include group comparisons of long-term training effects on cognitive development beyond data on IQ, Reading Readiness and Impulsivity-Reflectivity. However, the results of the initial assessment, which did examine various cognitive abilities and cognitive style preferences, provide some basis for speculation. On the one hand, there were significant cognitive style differences spelling more autonomous cognitive strategies for the Montessori schooled children at the end of the first year of training -- a finding, which suggests that a similar long-term trend is highly probable. On the other hand, the data did not show any systematic treatment trends relative to the cognitive abilities measured, suggesting that the long-range value of Montessori training, regarding this type of stimulation, is less likely to differentiate between this approach and conventional practice.

APPENDIX TO PART I

Page

SECTION A AGE, SEX, AND ETHNICITY TRENDS FOR THE POPULATION INVESTIGATED 115

Age Trends 115

Sex Trends 115

Ethnicity. 117

Supplementary Findings 119

SECTION B DESCRIPTION OF THE TEST BATTERY 123

SECTION C SAMPLE OF TEACHING LOG. 148

SECTION D TEACHER INTERVIEW 150

SECTION A

AGE, SEX AND ETHNICITY TRENDS FOR THE POPULATION INVESTIGATED

Age Trends

Perceptual and conceptual performance patterns for the two age groups showed a clear-cut age differential, with the five year olds consistently surpassing the fours. Of the 48 age comparisons summarized in Table A1, 41.5 (one tie) or 85 percent favored the older children -- a finding which far exceeds the .001 probability level and indicated achievement to be significantly related to age at these developmental stages.

Sex Trends

To determine the extent of performance differentials for boys and girls, the data for the two investigations were compared on this basis, by-passing the basic treatment conditions and pooling experimental and control samples in these sex comparisons. The results are summarized in Table A2, which illustrates the overall achievement levels for boys and girls.

The table reveals little of a systematic trend. There is no pattern of responding to the assessment tasks associated with the sex variable. In passing it should be noted that the variabilities associated with the means of Table A2 are quite large, the ranges varying between some 70 units for Discrimination Learning to some 12 units for Delayed Reaction. As a matter of fact, the variabilities are so great relative to the differences in means that none of the findings presented attain the 20 percent level of significance.

TABLE A1

PERFORMANCE PROFILES BY AGE, TEACHER AND TREATMENT

	Mont-1 Mean Scores			Mont-2 Mean Scores			Control Mean Scores		
Test	5	4	Direct	5	4	Direct	5	4	Direct
Perception (Achiev.)									
Formboard	2.0	2.0	5=4	2.0	2.0	5=4	2.0	2.0	5=4
Manikin	3.8	3.8	5=4	4.0	3.8	5>4	3.5	2.6	5>4
Bear Puzzle	2.8	1.8	5>4	3.0	1.8	5>4	2.3	1.0	5>4
Blocks	9.3	5.0	5>4	6.6	4.3	5>4	7.7	2.4	5>4
Total	17.9	12.6	5>4	15.6	11.9	5>4	15.5	8.0	5>4
Perception (Time)[a]									
Formboard	40.3	40.8	4>5	45.4	48.3	5>4	40.3	51.9	5>4
Manikin	22.3	30.8	5>4	20.4	22.5	5>4	26.2	42.6	5>4
Bear Puzzle	53.3	47.8	4>5	54.2	52.5	4>5	63.7	95.7	5>4
Total	115.9	119.4	5>4	120.0	123.3	5>4	130.2	190.2	5>4
Delayed Memory									
Immed. Recog.(no delay)	2.0	2.0	5=4	1.8	2.0	4>5	1.8	1.7	5>4
4 Minute	3.5	4.0	4>5	4.0	4.0	5=4	3.7	3.4	5>4
8 Minute	7.0	4.0	5>4	8.0	8.0	5=4	6.7	5.7	5>4
Total	12.5	10.0	5>4	13.8	14.0	4>5	12.2	10.8	5>4
Immed. Memory									
Recog. 1/3	.75	.75	5=4	1.0	.75	5>4	.67	.71	4>5
N/9 Recall	3.3	2.8	5>4	3.6	2.8	5>4	3.6	2.4	5>4
N/6 Recog.	3.0	2.0	5>4	3.0	1.5	5>4	1.9	1.6	5>4
Bead Pattern	4.5	2.5	5>4	4.8	3.3	5>4	3.1	3.1	5=4
Total	11.6	8.1	5>4	12.4	8.4	5>4	9.3	7.8	5>4
Discrim. Lrng.[b]									
Simple	2.3	3.5	5>4	3.2	2.5	4>5	3.0	2.9	4>5
Varied	2.5	18.3	5>4	5.0	4.5	4>5	3.3	8.1	5>4
Extra Dimens.	11.5	22.5	5>4	18.4	20.5	5>4	22.6	22.7	5>4
Total	16.3	44.3	5>4	26.6	27.5	5>4	28.9	33.7	5>4
Problem Solving[b]									
Single Alternat.	19.0	29.8	5>4	17.6	26.8	5>4	19.2	28.7	5>4
Double Alternat.	18.3	28.8	5>4	17.4	27.5	5>4	23.3	36.6	5>4
Total	37.3	58.6	5>4	35.0	54.3	5>4	42.5	65.3	5>4
Gen. Information	20.0	15.0	5>4	22.2	23.3	4>5	17.9	13.0	5>4
Relat. Concepts	23.8	14.5	5>4	24.8	20.5	5>4	22.5	18.9	5>4

[a] Time as well as achievement scores were computed for perceptual tasks; lower scores here indicate superior performance.

[b] Superior performance is indexed here by lower rather than the higher score.

TABLE A2

MEAN ACHIEVEMENT LEVELS FOR BOYS AND GIRLS

Area	Boys N=35	Girls N=43	Higher Performance
Perceptual Discrimination	15.8	13.5	Boys
Delayed Memory	10.7	11.6	Boys
Immediate Memory	9.2	10.6	Girls
Discrim. Learning[a]	32.5	31.4	Girls
Problem Solving[a]	50.4	46.1	Girls
General Information	18.6	17.7	Boys
Relat. Concepts	23.6	21.2	Boys

[a] Superior performance here is indexed by the lower rather than the higher score.

In each investigation, sex differences were also examined in relation to treatments, but the results of this analysis did not reveal any consistent trends indicating a differential training impact for boys and girls.

Ethnicity

Table A3 contains a similar combination of data from the two investigations with regard to ethnicity. A major difference emerges, however, between sex and ethnicity findings in that ethnicity does contribute significantly to performance on the assessment measures. The Puerto Rican children do less well on the more verbal tasks while performing roughly equally on the less verbal ones, as might be expected in a testing situation, where the assessment is not conducted in their home and "natural language." The variabilities characteristic of these data are again large, of the same order of magnitude as those associated with the sex variable. Despite this fact, the differences for General Information attain usually accepted levels of significance while those for Relational Concepts approach them. The difference in the Memory area -- also involving a strong component -- is in the same direction, but insignificant by usually accepted statistical standards.

TABLE A3

MEAN ACHIEVEMENT LEVELS FOR NEGRO AND PUERTO RICAN CHILDREN

Area	Negro N=42	Puerto Rican N=36	Higher Performance
Perceptual Discrimination	14.4	15.8	Puerto Ricans
Delayed Memory	12.2	9.9	Negroes
Immediate Memory	11.4	8.4	Negroes
Discrim. Learning[a]	29.8	30.8	Negroes
Problem Solving[a]	49.2	46.2	Puerto Ricans
General Information	23.4	11.5	Negroes
Relat. Concepts	24.6	18.3	Negroes

[a] Superior performance here is indexed by the lower rather than the higher score.

On the other side of the coin, the Puerto Rican children performed at a slightly higher level on the tasks of Simple Perceptual Discrimination and Problem Solving (Alternation). Performance was about the same for the two groups in Discrimination Learning.

SUPPLEMENTARY FINDINGS

In addition to these findings and the results presented in preceding chapters, which complete the presentation of results bearing on the specific questions investigated, this research yielded some definitive and quite interesting trends relating to IQ measurements.

Two of these trends pertained to the pretreatment evaluation based on the revised Stanford-Binet. One is the extremely wide spread of scores in this population, ranging, for example, from 63 to 116 in the public school study.

Another is the striking ethnic differential among the incoming pupils, indicating that the Negro children cluster toward the upper end of the distribution and the Puerto Rican children cluster toward the lower extreme. Initial IQ test data for the original sample of 103 children (there were subsequent dropouts reducing the final sample size) is summarized in Table A4. The Negro children outnumbered the Puerto Rican children by a ratio of 4:1 in the upper range (IQ of 100 and above); there was a precise reversal of this trend in the lower range (IQ of 70 and below), where the proportion of Puerto Rican children exceeded the Negroes by a 4:1 ratio. This ethnic trend was maintained, although reduced considerably, in the middle IQ range (80 to 100), where the Negro children were also in the majority.

Since the pretesting of the Puerto Rican youngsters was conducted in Spanish by a native Puerto Rican examiner, these findings cannot be explained in terms of a language handicap in the testing situation, but must rather be attributed to antecedent factors. One plausible explanation may be a pattern of parental conditioning making for a highly dependent child-mother relationship, which was observed to be a good deal more characteristic of the Puerto Rican youngsters in this study, and is typical of family life on the island as well. Theoretically, we may postulate that a maternal dependency pattern would be likely to create some dependency conflict for these children when they begin school, as a result of their initial confrontation with considerably increased demands for independence; and consequently, to undercut autonomous achievement striving. Presuming a more limited motivation for independent accomplishment, we would expect some depression of performance on intelligence measurements during the early period of school adjustment.

TABLE A4

DISTRIBUTION OF IQ SCORES FOR PUERTO RICAN AND NEGRO CHILDREN

Range	Negroes N=59	Puerto Ricans N=44
120-129	0	1
110-119	5	0
100-109	13	3
90- 99	14	5
80- 89	6	13
70- 79	4	14
60- 69	1	6
Below	0	2

This rationale is in fact supported by Beller's research, demonstrating a positive correlation between achievement on the Stanford-Binet and high autonomous achievement striving in prekindergarten children. Moreover, since the Puerto Rican and Negro children performed comparably on the posttreatment assessment (with the exception of the highly verbal measures), the initially poorer IQ performance of the Puerto Rican children at the beginning of the school year suggests the pattern of high dependency and lowered autonomous achievement striving postulated.

Another finding involved posttreatment IQ ratings, which were obtained for the public school English-speaking sample.[1] This data showed a large and consistent examiner effect, indicating a significant decrement in performance from pretest to posttest for subjects tested on each occasion by two different examiners. The group with the change in examiners lost 6.6 IQ points on retest while the constant-examiner group gained 5.7. Only two of the change group went up in IQ and only five of the constant cue group showed a decrement, two by one point, two by two points and one by four points. The difference between the two groups is significant near the one percent level by the Fisher Yates Exact Test and the Phi Coefficient, indicating extent of relationship to approximate .50. The test-retest correlations reflected this same effect from a different angle. For the change group, r = .57 and for the constant group it is .80.

---

[1] The initial IQ testing of these children was conducted by two examiners, one of whom did all the posttesting; thus half of the group was retested by a different examiner.

These findings suggest that examiner familiarity accounted for the higher performance of the children retested by the same examiner, presuming there were no differences in the testing skills of the two examiners. However, this assumption did not hold up when examiner comparisons were carried out, comparing mean pretest IQ of the subjects tested by each examiner. In fact, these comparisons showed a pattern of higher scores for the examiner who was not involved in the posttesting. Differences favoring this examiner, although not statistically signficant, nevertheless, attained the 20 percent level with a p. of 10. In view of the initially higher scores obtaining for this examiner, the data generates a different interpretation. Insofar as this examiner obtained better pretest performance, the posttest decrement in IQ for pupils whom she tested initially appears to reflect a drop in pupil motivation, as a function of exposure to a less skilled examiner on the posttest. Given the indications of an examiner differential in initial testing outcomes, valid comparison of experimentals and controls with respect to training effects on IQ performance was obviously not feasible.

SECTION B

DESCRIPTION OF THE TEST BATTERY

The various assessment measures from the Frengel and Jenkins battery which were used to assess perceptual and cognitive skills were the following, administered in the order of their presentation here.

1. DELAYED MEMORY

Materials for the task consist of a masonite box with five doors on one side and five white drawers on the other side. The box is presented with the drawer side facing the child. A cup is also presented. (Consider the drawers as numbered 1-5 with 1 on the examiner's extreme right.)

Immediate Delay The cup is hidden in drawer one. The child is instructed to close his eyes, open them and look for the cup. If he finds it, he proceeds to the four minute delay task.

Scoring Maximum score is 2.
If child does not succeed, cup is hidden in drawer four and another trial given. For success on this trial, 1 point is given; if failure, testing is discontinued.

Four Minute Delay The cup is hidden in drawer two. The child then spends four minutes answering questions from the General Information Test. At the end of this time, he is instructed to find the cup. If he finds it he proceeds to eight minute delay task.

Scoring Maximum score is 4.

If child does not succeed, cup is hidden in drawer four and another trial given with a four minute delay. For success on this trial, 2 points are given; if failure, testing is discontinued.

Eight Minute Delay The cup is hidden in drawer three. The child is given eight minutes of questioning from the General Information test. At the end of this time he looks for the cup.

Scoring Maximum score is 8.
Procedure is same as for preceding tasks, but second trial here earns 4 points.

Maximum score for this subtest is 14.

2. GENERAL INFORMATION AND COMPREHENSION

Part I (General Information)

TEST QUESTIONS	ACCEPTABLE RESPONSES
1. Show me your nose. Touch it.	Must touch or clearly point to nose.
2. How many ears do you have?	Two. (Score verbal response: if child holds up three fingers but responds Two, score 1; if child holds up two fingers but responds Three, score 0.)
3. (Examiner holds up thumb.) What do you call this finger?	Thumb....Thumbkin, etc.
4. What comes in a bottle?	Soda...Milk...Water..., etc. (if child gives an uncommon response, such as Ship or animals, ask him to explain further. Answers indicating things that come in jars - baby food, fruit, jam, etc. - are scored 0.)
5. What lives in water? (If child seems not to understand, say "WELL, WHAT LIVES IN A RIVER?")	Any fish...Whale...Frog...Snake... Turtle...Duck... Definite water plants such as lilies, algae, reeds.
6. What is the color of grass?	Green. (If child mentions another color, such as Brown, say, "WHAT OTHER COLOR CAN IT BE?" If child points to a green object to indicate the color, score 1.)
7. (Be sure to ask for three animals, as follows.) Tell me the names of two animals. (After child has named two, continue.) Tell me another one.	(Child must name three to receive credit. If child gives a proper name, such as that of his own dog, Rusty, say, "WHAT IS RUSTY?" If child names only one or two animals, say, "TELL ME ANOTHER KIND OF ANIMAL," until he has tried to name three.)
8. From what animal do we get milk?	Cow...Goat...Mother (But only if child means the mother's breast.)
9. What shines in the sky at night?	Stars...Moon. (If child says Airplane Lights, ask what else shines in the sky at night.)

TEST QUESTIONS	ACCEPTABLE RESPONSES
10. How many legs does a dog have?	Four...Two in front and two in back. (Score verbal response, as in Question 2.)
11. What should you put on a letter before you mail it?	Stamp. (If child says Envelope, say, "WHAT SHOULD YOU PUT ON THE ENVELOPE? If child says Address, ask what else is needed.)
12. What do you need to put two pieces of wood together?	Glue...Nails...Cement...Tape...String. (If child says Hammer, ask what else is needed.)
13. Name two things that are round.	Circle...Ball...Plate...Face...Egg... Pencil, etc. (Child must name two. If he names only one, ask for a second. If child names two examples of same concept, as baseball and basketball, ask for another kind of round object. Only one cylindrical object, such as pencil or tree, is accepted; if child names two cylindrical objects, ask for another kind of round object.)
14. What must you do to make water boil?	Put it on the stove...Heat it...Put fire under it...Cook it.
15. In what kind of store do we buy sugar?	Grocery...Food store...Supermarket... Name of local store, like A & P. ("Sugar store" is scored 0.)
16. How many pennies make a nickel?	Five.
17. What are shoes made of?	Leather...Rubber...Cloth... Plastic. (Wood is scored 0.)
18. How many days make a week?	Seven.
19. What is bread made of?	Flour...Wheat...Meal (only if child means corn meal). (If child says dough, ask, "WHAT IS DOUGH MADE OF?")
20. What are the four seasons of the year?	Summer, fall (or autumn), winter, spring, (Child not required to give them in order.)
21. What is the color of rubies?	Red...Maroon...Scarlet, etc.

TEST QUESTIONS	ACCEPTABLE RESPONSES
22. How many things make a dozen?	Twelve.
23. Where does the sun set?	West. (If child points, or says, "behind the mountains," say, "YES, BUT WHAT DIRECTION IS THAT?

Scoring Maximum score for this part is 23. One point for each correct response. Essentials of acceptable answers are noted below. Where several possible answers are listed (these are separated by periods), the subject need mention only one to receive credit.

Part II (Comprehension)

Secure the child's attention and say...

a. WHAT SHOULD YOU DO WHEN YOU ARE HUNGRY?

b. WHAT SHOULD YOU DO WHEN YOU ARE SLEEPY?

Record the responses to each of the questions on the blank provided on the score sheet. If both answers are reasonable, go on to the following questions. If either answer is inappropriate, ask no more comprehension questions.

Directions Read each question slowly. If the child is distracted or seemingly has not caught the entire question, it may be repeated; but do not alter or abbreviate it. If a child is hesitant, encourage him with such as YES or GO AHEAD. If the child gives no response after 15 seconds, the examiner may repeat the question once more, but no further help should be given, except as indicated below.

When a response is unclear or ambiguous, it is permissible for the examiner to add PLEASE EXPLAIN or TELL ME MORE ABOUT IT.

In Questions 7, 8, 9, 10, 14 and 15, if a child states only one reason, say, GIVE ME ANOTHER REASON WHY ... HOUSES HAVE WINDOWS (or a similar re-statement of the question.)

TEST QUESTIONS

1. Why shouldn't you play with matches?

   General: Might cause destruction of property or injury to a person.

   2 POINTS - (Damage to property or other people)... It will make a fire... So your house won't burn up... So people won't get hurt.

   1 POINT - (Damage to self)... You'll get burned... They're dangerous... Can hurt yourself.

   0 POINTS - They will burn... You'll get a spanking... That's what Smokey Bear says (Q. not further elaborated).

2. Why do you need to wash your face and hands?

   General: To keep clean; to avoid germs.

   2 POINTS - To get clean... So you won't get germs... So you won't look dirty... So you won't get things dirty.

   1 POINT - To get clean for supper (a party)... So we can eat (go to school)... They're dirty.

   0 POINTS - Mother tells you to.

3. What is the thing to do when you cut your finger?

   General: Put a bandage on it; cleanse or medicate it.

   2 POINTS - Put a Band-Aid (tape,rag) on it... Fix it up with medicine (iodine)... Wash it.

   1 POINT - Tell my mother... Treat it (Q. not further elaborated)... Go to the doctor (hospital).

   0 POINTS - Go in the house... Cry... You bleed.

4. Why do we need clocks?

   General: To tell time.

   2 POINTS - To see what time it is... To tell time.

   1 POINT - To wake up... To tell when it's time to go to school (bed).

   0 POINTS - To keep on the wall... To play with.

5. What is the thing to do if you lose your friend's ball (for girls, doll)?

General: Replace the loss.

2 POINTS - Give him (her) one of mine... Buy him (her) a new one.

1 POINT - Find it... Look for it... Put an ad in the paper... Tell someone to get it for you... Tell my mother.

0 POINTS - I guess I'd just cry... Tell him I'm sorry... Call the police.

6. Why should you go to the toilet before going to bed?

General: To prevent bed-wetting or to avoid having to get up at night.

2 POINTS - So you won't make in the bed... Because you drink a lot of water. (Q.) Because you'll have to go at night... Because you wet your pants.

1 POINT - (Any specific activity)... To go potty... To take a bath.

0 POINTS - To go to the bathroom... Mommy makes me... You've got to go.

7. Why do houses have windows?

General: To see out; to let in light; for ventilation. Cause you look out... Sun can shine in... Get air... Get cooled off when it's hot.

2 POINTS - A response recognizing at least two of the general ideas above.

1 POINT - A response including one general idea.

0 POINTS - So the rain (Bugs) won't come in... So people won't get cold... To keep wind out of the house.

8. Why do we wear clothes?

General: For warmth; because of modesty concerning nakedness. Cause you get cold... So you won't be naked... So nobody sees us.

2 POINTS - A response recognizing both of the general ideas above.

1 POINT - A response including one general idea.

0 POINTS - So people won't laugh at us... It's nasty... To look nice... To go to school... Because you'll look funny... You'd be arrested.

9. Why do people have to work?

General: To earn money (or to buy things for others); to make things for use; to keep busy. To get money... To buy food... To build houses... To grow food... If they don't work they won't have anything to do.

2 POINTS - A response recognizing at least two of the general ideas above.

1 POINT - A response including one general idea.

0 POINTS - So I won't have to work next time... To keep the house clean... They want to (Q. Not further elaborated)... To deliver oil (or other mention of his father's job)... Because they have to.

10. Why is it better to light a room with electric lights than with candles?

General: Safety; better illumination; easier to light; less likely to become accidentally extinguished; less frequent replacement.

Candle could burn you... You can see better... A candle doesn't make much light... Have to light a candle with a match... Candles blow out... Bulbs last longer... Candles will burn out but lights won't.

2 POINTS - A response recognizing at least two of the general ideas above.

1 POINT - A response including one general idea.

0 POINTS - You can't put a candle in a bulb holder... It's on a birthday cake... It's prettier... In case the lights go out... They're better.

11. Why should children who are sick stay home?

General: To avoid spreading infection; to get well.

2 POINTS - Other children could catch it... So the class wouldn't get the germs.

1 POINT - If you go out you'll get worse... So you don't get sicker... So they won't get a bad cold... To get better... So Mother can take care of you.

0 POINTS - To take them to the doctor... Because he has fever... Take medicine... To stay in bed... They're sick... So they won't throw up in school.

12. What is the thing to do if you are sent to buy a loaf of bread and the grocer says he does not have any more?

General: Go to another store for it.

2 POINTS - Find it somewhere else... Get biscuits (rolls)... Borrow from a neighbor.

1 POINT - Go back and tell her he didn't have any more so she could send me somewhere else to get some... Go home and ask what to do... Get something else (Q. Not further elaborated).

0 POINTS - Go without it... Wait till another time and buy it... Go home and tell my mother (except in rural districts where there is only one store, then score 2 points)... Make some.

13. What is the thing to do if a boy (girl) much smaller than yourself starts to fight with you?

General: Not to fight with him.

2 POINTS - Don't fight with him... Just walk away; tell him (her) you don't want to fight... Don't hit him; find out what's the matter.

1 POINT - Tell him you don't want to hurt him... Ask someone to stop him... Tell him not to fight... Tell his (my) mother... Go home.

0 POINTS - I'd just let him fight... Let him win. (Q.) If he's littler don't hit him so hard... Don't do anything.

14. Why is it better to build a house of brick than of wood?

General: More durable; safer; sturdier; better insulation.

Brick will last longer... You don't have to paint brick... Wood can rot... Termites eat wood... Wood can burn... Wood isn't as strong... Brick house is warmer.

2 POINTS - A response recognizing at least two of the general ideas above.

1 POINT - A response including at least one general idea.

0 POINTS - Because it isn't so easy for rain to get in... Brick is harder... Because wood could break... The wolf could blow down (unless child mentions tornado or storm).

15. Why are criminals locked up?

General: As deterrent; protection for society; example to others; punishment and revenge; rehabilitation; segregation.

So they won't steal any more... So nobody will get robbed... They'll kill people (future tense)... They would steal again.

2 POINTS - A response recognizing at least two of the general ideas above.

1 POINT - A response including at least one general idea.

0 POINTS - They're bad... They did something wrong... They kill people (present tense)... They aren't doing any good for anybody when they're unlocked. (Q.) If they weren't criminals they wouldn't be locked up... They're dangerous (Q. Not further elaborated)... They're robbers and they have to go to jail. (Q.) I don't know.

Scoring Each item is scored 2, 1, or 0, depending on the degree of generalization and the quality of the response. Since no attempt has been made to list all possible replies, the examiner will have to use his judgment when he encounters unusual responses. Poor verbalization should not be penalized -- a satisfactory 2-point response may be badly worded. Discontinued after four consecutive failures.

For every item, the general criterion is shown, followed by some typical answers. Most of the 0-point examples given typify marginal responses.

Maximum score for this part is 30.

Maximum total score for General Information and Comprehension is 53.

3. SIMPLE PERCEPTUAL DISCRIMINATION

Formboard - The Sejuin Goddard Formboard in completed form is shown to the child and is then turned upside down so that all pieces lie near him. The experimenter then completes the puzzle and again turns it upside down, asking S to complete it. (Time limit of two minutes.)

Scoring Maximum score is 2.

Manikin Puzzle - The pieces from the WISC Manikin are dumped out of the box in front of the child and the examiner assembles it for him. The pieces are then put in front of S in a set order and he is instructed to assemble it. (Time limit of two minutes.)

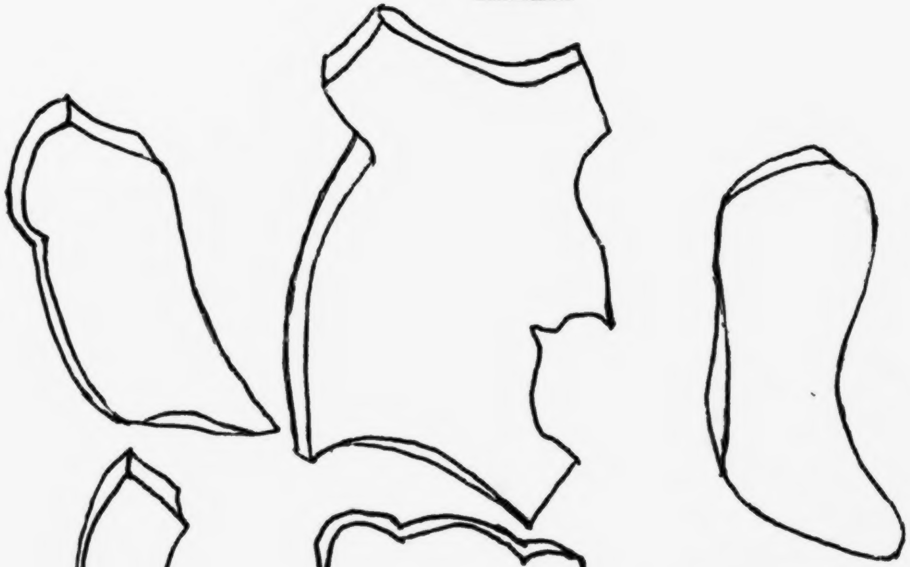
Scoring Maximum score is 4. If S fails, discontinue testing for this section.

Bear Puzzle - The pieces for the bear puzzle are dumped from the box and then turned right side up by the examiner. The bear is slowly put together saying...

I CAN PUT THESE PIECES TOGETHER TO MAKE A BEAR. WATCH HOW I DO IT.

The pieces are then placed in the following order....

Child



Examiner

The examiner then says.... NOW YOU PUT THESE PIECES TOGETHER FOR ME.

YOU TRY TO MAKE THE BEAR. (Time limit of 2 minutes.)

Scoring Perfect score: 4 points

Two limbs interchanged, otherwise correct: 3 points

Three limbs interchanged, otherwise correct: 2 points

Only head correct: 1 point

If S fails, testing for this section is discontinued.

Block Design

Materials. 6 flat blocks red on one side and white on the other
8 flat blocks red on one side and $\frac{1}{2}$ red $\frac{1}{2}$ white on the other

Directions. The child works directly from a block model on all but the last three designs. The designs are shown on the score sheets, where the shaded areas represent red.

In setting up the model the examiner should make sure that the designs are properly oriented. Construct the model so that the top edge of the design as printed on the score sheet faces the child and the lower edge faces the examiner.

In explaining the demonstration, the examiner should use such phrases as, I PUT A RED BLOCK HERE ... AND ANOTHER RED ONE HERE ... HERE I HAVE TO USE A RED AND WHITE BLOCK, etc.

Timing for each trial begins as soon as the last work in the instructions is completed.

Two trials of each design are permitted. If the child succeeds on the first trial, go to the next design. If he fails, allow a second trial.

On designs 1 through 4, if the child positions the blocks correctly but leaves definite gaps between them, the examiner should ask, IS THAT RIGHT? If the child does not close the gap, the item is scored as failed, but the examiner should demonstrate proper closure before proceeding to the next trial.

Rotations. Any reproductions of Designs 1 through 4 that can be produced by rotation of the model are to be counted as correct. Rotation does not include reversal of colors. Correct the blocks and say, BUT YOU SEE, IT GOES THIS WAY.

Where to Start and When to Discontinue

For Designs 1 and 2, use the 6 blocks which are painted red on one side and white on the other.

Design 1. Behind a screen (the Manual may be used for this purpose), prearrange the set of 3 blocks as shown in the diagram of Design 1 on the Record Form. Place the model in front of the child. Now take the 3 remaining blocks and casually place them before the child. (Be sure that the blocks are not in a straight line; 1 red and 2 white faces should show.) Say YOU SEE THESE BLOCKS - THEY ARE PAINTED RED ON ONE SIDE AND WHITE ON THE OTHER (show both sides). I'M GOING TO PUT THEM TOGETHER TO LOOK LIKE THIS. (Point to the model.) WATCH ME. Slowly copy the model, explaining each step. After a brief pause, scramble this arrangement. Then replace the blocks as above, with 1 red and 2 white faces showing, and say, NOW YOU MAKE ME ONE JUST LIKE THIS. (Point to the model.) If the child fails to complete the design within the time limit or arranges the blocks incorrectly, say, NO, IT SHOULD GO LIKE THIS, and illustrate by correctly arranging the child's performance. Then break up the second demonstration, place the blocks as originally presented, and say, NOW YOU DO IT BY YOURSELF. GO AHEAD.

Time: 30 seconds for either trial.

Design 2. Whether the child fails or passes Design 1, set up the model for Design 2 out of the child's sight. Casually place the 3 remaining blocks in front of the child (1 red, 2 white faces), and say (pointing to the model), NOW YOU MAKE ME ONE LIKE THIS. GO AHEAD.

If the child fails, say, NO, IT SHOULD GO LIKE THIS. (Illustrate by correctly arranging the child's incorrect performance and explaining each step.) Then break up your demonstration, replace the blocks as originally presented, and say, NOW YOU DO IT YOURSELF.

Time: 30 seconds for either trial.

For Designs 3 through 7, use the 8 blocks which are painted red on one side and one-half red and one-half white on the other.

Designs 3 and 4. Take 2 of the blocks and make a model of Design 3 out of the child's sight, and place it in front of him. Then, taking 2 other similar blocks in hand, say, HERE ARE TWO BLOCKS: EACH IS PAINTED RED ON ONE SIDE AND (pause and stress) HALF RED AND HALF WHITE ON THE OTHER. I AM GOING TO PUT THESE BLOCKS TOGETHER TO MAKE A DESIGN THAT LOOKS JUST LIKE THIS. (Point to the model.) WATCH ME. While assembling the blocks, casually remark, THIS TIME THE BLOCKS GO UP AND DOWN. Explain each step, and say, YOU SEE, THEY LOOK THE SAME NOW. (Point to the model and to your own performance.) Pick up the blocks of your demonstration, hand them to the child, and say, NOW YOU MAKE ONE JUST LIKE THIS. (Point to the model.)

If the child fails, say, WATCH ME AGAIN, and demonstrate a second time. Then hand the blocks to the child and say, NOW YOU MAKE ONE THAT LOOKS LIKE THIS. (Point to the model.)

Whether the child passes or fails Design 3, present Design 4. Proceed as in Design 3, but omit the remark, THIS TIME THE BLOCKS GO UP AND DOWN.

Time: 30 seconds for either trial.

Design 5. Use 4 of the blocks and make a model of Design 5 out of the child's sight and place it in front of him. Take the remaining 4 blocks, scatter them haphazardly before the child (no special arrangement is required, but be careful that the blocks do not all show the same face), and say, NOW I HAVE SOME MORE BLOCKS THAT ARE PAINTED RED ON ONE SIDE AND HALF RED AND HALF WHITE ON THE OTHER SIDE. I AM GOING TO PUT THESE BLOCKS TOGETHER TO MAKE THEM LOOK LIKE THIS. (Point to the model.) WATCH ME. Explain each step. After completing the demonstration, pick up the design you have just made, put the blocks in front of the child in mixed order, and say, NOW YOU MAKE ME ONE JUST LIKE THIS. (Point to the model.) GO AHEAD.

If the child fails, repeat the demonstration and allow a second trial.

Time: 45 seconds for either trial.

Design 6. Make a model of Design 6 out of the child's sight and place the remaining blocks in mixed order in front of the child. This time without demonstration say, NOW YOU MAKE ME ONE LIKE THIS. (Point to the model.) MAKE IT ALL BY YOURSELF. GO AHEAD.

If the child fails, demonstrate with explanation. Then scramble the demonstration, scatter the blocks in front of the child and say, NOW YOU TRY IT AGAIN.

Time: 45 seconds for either trial.

Design 7. Proceed as in Design 6, presenting Design 7 without demonstration and with the remark, NOW MAKE ONE LIKE THIS.

If the child fails, demonstrate and explain as in Design 6, and allow a second trial.

Time: 60 seconds for either trial.

For Designs 8 through 10, use the bound booklet and four of the blocks used in the previous design.

Design 8. Present the card with Design 8 (place the unbound edge toward the child) and say, NOW I WANT TO SEE IF YOU CAN PUT THE BLOCKS TOGETHER SO THAT THEY WILL LOOK LIKE THE DESIGN (PICTURE) ON THIS CARD. WATCH ME. Put the blocks together, indicating by gestures and with words that you are being guided by the design on the card. After completing the demonstration, scramble the blocks in front of the child and say, NOW GO AHEAD. MAKE ONE LIKE THIS.

If the child fails, repeat the demonstration and allow a second trial.

Time: 60 seconds for either trial.

Designs 9 and 10. Present the card and blocks without demonstration and say, PUT THESE TOGETHER TO MAKE THEM LOOK LIKE THIS. (Point to the card.) If the child fails, demonstrate and explain, and allow a second trial.

Time: 75 seconds for either trial.

Scoring Maximum score for this subtest is 30.

Each design is scored 2, 1, or 0. Give 2 points for each design correctly reproduced within the time limit on the first trial, 1 point if correct within the time limit on the second trial, and 0 points if both trials are failed.

Any reproduction of Designs 1 through 4 that can be produced by rotation of the model is to be counted as correct. Rotations of Designs 5 through 10 are scored as failures. If the child positions the blocks correctly, but leaves definite gaps between them, score as a failure.

In the "Pass-Fail" column on the Record Form, enter a P if the child made an acceptable reproduction of the design, and an F if he failed. In the "Score" column, circle the 2 if the child passed on his first trial, circle the 1 if he passed on his second trial, and circle the 0 if he failed both trials. Sum the circled numbers to obtain the total.

NOTE: The examiner is cautioned to use the 0's, not the F's, in determining when to discontinue the test.

4. RELATIONAL CONCEPTS

1. Recognition of an instance

Material for the task consists of 3 boxes, a pig, a piglet, a cow, a calf, two shoes, two crayons, two glasses (one filled with water), two pencils, a 3-piece and a 2-piece train, and two airplanes. The items are presented in pairs and the child is asked to point to the required instance of a concept.

For convenience the questions are printed on the score sheet.

Draw a circle around the choice the child makes. The child is always asked to point to the object except in the case of HEAVY and LIGHT where he is asked to lift them to make a judgment.

1.	SHOW ME THE TALL ONE (The pencils are presented vertically with the erasers up.)	Tall Pencil	Short Pencil
2.	WHERE IS THE BIG ONE	Calf	Cow
3.	SHOW ME THE EMPTY GLASS (Pour the water from the full to the empty glass leaving the empty glass where it was on the table.)	Full glass	Empty glass
4.	WHICH GLASS IS FULL	Empty glass	Full glass
5.	WHERE IS THE SHORT ONE	3-piece train	2-piece train
6.	SHOW ME THE THIN BOX	Thin box	Thick box
7.	WHICH PLANE FLIES HIGH	Low plane	High plane
8.	WHERE IS THE LOW PLANE	High plane	Low plane
9.	SHOW ME THE LITTLE ONE	Piglet	Pig
10.	WHERE IS THE THICK ONE	Thin crayon	Thick crayon
11.	SHOW ME THE LONG ONE (The pencils are presented horizontally with the tips at the same distance from the examiner and the erasers toward the child.)	Long pencil	Short pencil

Present the two shoes and say, PICK THESE UP. Make sure the child has one in each hand. Do the same for the boxes in item 13.

12.	GIVE ME THE LIGHT ONE	Light shoe	Heavy shoe
13.	GIVE ME THE HEAVY ONE	Light Box	Heavy box

2. Demonstrating a concept

Material for the task consists of 2 green blocks, one wooden block, one car and one plane. The three blocks are placed in a horizontal row in front of the child with about an inch between the blocks. They are placed in the order Wood - Green - Green. The car is placed about 6 inches behind the block row, facing the child.

The plane is handed to the child and the following directions are given.

1. MAKE THE PLANE FLY OVER THE CAR.

The examiner places his hand about 6 inches above the table and says...

2. FLY ABOVE MY HAND. GOOD.
3. FLY BELOW MY HAND.
4. PUT THE PLANE BEHIND THE CAR.

The plane is now removed. Say...

5. GIVE ME THE MIDDLE BLOCK.

Space the remaining blocks 6 inches apart.

6. DRIVE THE CAR AROUND THIS BLOCK (on E's left).
7. MAKE IT GO BACKWARD.
8. MAKE IT GO FORWARD.
9. PARK THE CAR BETWEEN THE BLOCKS. (PUT IT BETWEEN THE BLOCKS).

Remove the car from the table.

10. GIVE ME ONE BLOCK.
11. WHO HAS MORE BLOCKS?
12. TAKE ALL THE BLOCKS.
13. WHO HAS NONE?
14. GIVE ME SOME BLOCKS.
15. WHO HAS LESS?

Build a tower with two blocks and place the third beside it.

16. WHAT BLOCK IS ON THE BOTTOM?

Remove one of the blocks and set one in front of the child. Hand him the third block saying...

17. PUT THIS UNDER YOUR BLOCK.

18. WHICH BLOCK IS ON THE TOP?

Scoring Maximum score for this subtest is 18, one point for each correct response.

5. IMMEDIATE MEMORY

Memory by Recognition

a - Memory for a single object - The child is shown a brush, a comb, and a safety pin and is asked to remember the brush. The items are removed and after 15 seconds, are returned to the table. S must then show the examiner the toy he was supposed to remember.

b - Memory for several objects - The child is shown and asked to remember a toy key, cow and airplane. These objects are removed and after 15 seconds are dumped onto the table along with a toy table, iron and cup. S must identify the three original items.

Scoring Maximum score is 4.

Memory by Recall - Materials for this task consist of 9 objects; a car, baby, hat, shoe, horse, crayon, ball, watch and a chair. The items are presented in the above order and the child names each one. After all 9 items are presented the child is asked to remember all of them, is given 15 seconds to do so, and the items are then taken away. S must name the objects which are no longer in view.

Scoring Maximum score is 9.

Memory for a Pattern - The materials for the task consist of a set of blue beads and two shoelaces. The experimenter places a square bead on the string. S is instructed to do the same.

Scoring Maximum score is 2.

If S picks correct bead he receives 1 point; if he puts it on the string he gets another point.

b - Three bead pattern - The experimenter strings three round beads and shows it to the child. He is allowed five seconds to view the pattern and it is then removed. S is instructed to reproduce the pattern.

Scoring Maximum score is 2.

c - Five bead pattern - Five beads are strung in the following order- square, round, square, round, square. The child is allowed to view the pattern for ten seconds and it is then removed. S is instructed to duplicate the pattern.

Scoring Maximum score is 2.

d - Eight beads are strung in the following order- two square, two round, two square, two cylindrical. The child is allowed 15 seconds to view the pattern. It is then removed and S is instructed to duplicate it.

Scoring Maximum score is 2.

Maximum score for this subtest is 21. If S fails on anyone of the first three items, testing for this section is discontinued.

6. DISCRIMINATION LEARNING

Simple Form Discrimination - The materials for this task are 36 cards in a ring binder. On each card are three drawn forms; a circle, a square and a triangle. The correct stimulus is always the square. The experimenter tells the child:

"This is a guessing game. I'm thinking about something in this picture. Try to guess what it is. I'll always be thinking of the same thing. What am I thinking about? Point to it."

The child is allowed to guess until he points to the square. The procedure is continued in the same manner throughout the 36 cards or until S makes 5 consecutive correct first choice responses.

Scoring Maximum score is the number of the trial on which S makes five correct consecutive responses. If S fails to achieve criterion level, he gets a score of 36 and testing on this measure is discontinued. In this case, a score of 36 is automatically given for each of the following tasks, although S is not tested on either.

Varied Form Discrimination - Materials for this task consist of 36 cards in a ring binder. On each card are three forms (circle, square, triangle) in three colors (red, yellow and blue). The correct choice is the triangle. The same instructions are used as in simple form discrimination.

Scoring Same scoring as on preceding task.

Extra Dimensional Shift - The materials for the task are the same set of cards used in the varied form discrimination, but beginning in the reverse order. The correct stimulus is yellow, regardless of the shape. The same instructions are used as in the above two tests.

Scoring Same scoring as on preceding tasks.

Maximum score for this subtest is 3 and minimum is 108, with the lower score indicating superior performance.

7. PROBLEM SOLVING

Single Alternation - Material for the task consists of a box with five draws and a toy doll. The box has five doors which open up and these face the child. The doll is hidden in the compartment on the examiners extreme right. The child is not to see where the doll is hidden. He is then asked to look for it and does so until he finds it. On the second trial the doll is placed in the extreme left compartment, then right, then left... etc. This procedure is continued for 48 trials or until the child makes 8 consecutive correct first response choices.

Scoring Maximum score is the number of trials on which S makes eight correct consecutive responses. If S fails to achieve criterion level, he gets a score of 48, and testing on this measure is discontinued. In this case, a score of 48 is automatically given for each of the following tasks, although it is not actually administered.

Double Alternation - Materials are the same as for single alternation. The doll is hidden in the right box, the right again, the left, then the left again following a right-right-left-left pattern. Testing continues until the child makes 8 consecutive correct first choices or until 48 trials have been presented. Scoring is the same as in single alternation.

Scoring Same scoring as on preceding task.
Maximum score for this subtest is 2 and minimum is 96 with the lower score indicating superior performance.

SECTION C

DAILY TEACHING LOG -- RECORD SHEET

Week of ______ Please check one: Monday___Tuesday___Wednesday___Thursday___Friday___

TYPE OF LESSON	SPECIFIC TEACHING AIM	TEACHING STRAGETY	C-Class Activity SG-Small Group I-Individual
Describe	Specify precisely the pupil learning outcome desired	Specify learning activity employed by teacher to implement AIM	Code

TEACHING LOG MONTHLY CHECKLIST

Month of ________

Please indicate which activities you have emphasized during the month by following this procedure: FOR ACTIVITIES STRESSED, INDICATE BY A 3, FOR ACTIVITIES ONLY MODERATELY EMPHASIZED, INDICATE BY A 2, FOR ACTIVITIES RECEIVING MINIMAL ATTENTION, INDICATE BY 1.

LANGUAGE	INSTRUCTIONAL FOCUS
Stimulate children to use language	________
Develop pleasure and delight in language (poetry, rhyming and word games, etc.)	________
Expand speaking vocabulary	________
Improve listening skills	________
MOTOR COORDINATION AND CONTROL	
Develop flexibility, coordination and balance in use of body	________
Improve eye-hand coordination	________
Learn to move to differing rhythmic patterns	________
SENSORY AWARENESS AND SENSITIVITY	
Increase children's sensorial awareness, sensitivity and discriminatory capacity with respect to:	
TACTILE SENSATIONS	________
KINESTHETIC (BODY) SENSATIONS	________
SOUND SENSATIONS	________
SMELL SENSATIONS	________
VISUAL STIMULI (COLOR, SHAPE, SIZE)	________

SCIENCE

Develop reasoning ability -- cause and effect relationships ______________________________

Activate curiosity, questioning attitude ______________________________

Experiment to discover basic science facts, concepts, relationships ______________________________

MATHEMATICS

Acquire number concepts ______________________________

Learn to count ______________________________

Other - ______________________________

SECTION D

TEACHER INTERVIEW

I'd like to talk with you a little about preschool education and your own program as well.

1. First of all, what do you think children like yours should be getting from a prekindergarten program?

2. If you were asked to design a preschool program for such children, what would be your top priority goals? Why?

3. Now let's talk about your own program. How would you describe it?

4. What do you feel is good about it? What do you see as its chief limitations?

5. Thinking back over the year, what would you say have been your major teaching objectives for these classes? What kinds of activities have you been stressing in your program?

6. In what specific respects have you observed changes in these children?

7. What do you see as the teacher's most important function in a program of this kind?

8. What specific teacher qualities do you consider to be most important for effective teaching of these youngsters?

9. Are there any particular strategies that work well for you in managing your classes?

10. You have been working hard with these children all year. Suppose that you had a meeting with each parent during the summer, where you got feedback on the child's behavior out of school. What sort of behavior data would be most gratifying to you, most indicative of a successful teaching effort on your part?

11. Prekindergarten training may facilitate growth in a number of directions. Please look over the following list of behavioral outcomes and rate them in order of their importance, according to your own professional perspective.

consideration for others

resourcefulness

freedom of self-expression

attentiveness, ability to concentrate

self-restraint, control

orderliness

self-reliance

cooperativeness

knowledge about environment

ability to adjust to routines and rules

specific skills

self-confidence

REFERENCES

1. Banta, Thomas J. "Educating children for adulthood." Young children, v 21, 1966. p 272-280. (This paper was reprinted in slightly revised form in The American Montessori bulletin, v 5, n 2, 1967. p 1-8.)

2. Banta, Thomas J. "Research on Montessori and the disadvantaged." (In Orem, R.C., ed. Montessori and the special child. New York, Putnam, 1967.)

3. Banta, Thomas J. "Third progress report. Montessori Research Project. University of Cincinnati, August 1967." The American Montessori Society bulletin, v 7, n 1, 1969. p 10-14.

4. Beller, E. Kuno. "The impact of pre-school experience on intellectual development in educationally deprived children." Paper delivered at the annual meeting, American Educational Research Association, Chicago, February 1966.

5. Berger, Barbara. "Researching Dottoressa Montessori." The urban review, v 2, December 1967. p 21-27, and The American Montessori Society bulletin, v 6, 1968. p 1-8.

6. Biber, Barbara, Herbert L. Zimiles, Patricia Minuchin, and Edna Shapiro. The psychological impact of school experience: series of papers on selected findings. Mimeograph. November 1962.

7. Bouchard, Ruth and Bernard Mackler. A prekindergarten program for four year olds. New York, Center for Urban Education, 1967.

8. Capobianco, R. J. "A pilot project for culturally disadvantaged preschool children." Journal of special education, v 1, 1967. p 191-196.

9. Crandall, Vaughn J., Walter Katkovsky and Anne Preston. "Motivational and ability determinants of young children's intellectual achievement behaviors." Child development, v 33, 1962. p 643-661.

10. Crandall, Virginia C. "Achievement behavior in young children." Young children, v 20, November 1964. p 77-90.

11. Dennis, David and Adelaide Glaser. "A study of visual perception as related to cultural deprivation." U.S. Children's Bureau. Research relating to children, Bulletin No. 21, June 1966-April 1967. p 15. (Abstract)

12. Eisenberg, Leon and Sonia F. Osler. "Study of early cognitive development in culturally disadvantaged children." U.S. Children's Bureau. *Research relating to children, Bulletin No. 21*, June 1966-April 1967. p 24. (Abstract)

13. Elkind, David. "Piaget and Montessori." *Harvard educational review*, v 37, 1967. p 535-545.

14. Flavell, John H. *The developmental psychology of Jean Piaget*. Princeton, N.J., Van Nostrand, 1963.

15. Fleege, Urban H., Michael Black, and John Rackausas. *Montessori preschool education*. *Final report*. Washington, U.S. Office of Education, June 1967. (BR5-1061) (ERIC ED 017 320)

16. Foulke, E. "The role of experience in the formation of concepts." *The American Montessori Society bulletin*, v 1, n 2, 1963.

17. Fowler, William. "Cognitive learning in infancy and early childhood." *Psychological bulletin*, v 59, n 2, 1962. p 116-152.

18. Fowler, William. "Longitudinal study of early stimulation in the emergence of cognitive processes." (*In* Conference on Pre-School Education, Chicago, 1966). *Early education*, edited by Robert D. Hess and Roberta Meyer Bear. Chicago, Aldine Pub. Co., 1968.

19. Franklin, Adele, Jules Henry, Barbara Biber, and Leah Levinger. "The teacher's role in creativity. Symposium, 1958." *American journal of orthopsychiatry*, v 29, April 1959. p 266-297.

20. Freud, Anna. *The ego and the mechanisms of defense*. New York, International Universities Press, 1946.

21. Freud, Anna. *Normality and pathology in childhood*. New York, International Universities Press, 1946.

22. Gardner, Riley W. "A psychologist looks at Montessori." *The American Montessori Society bulletin*, v 4, n 1&2, 1966.

23. Goldstein, Kenneth M. and Sherwood B. Chorost. "A preliminary evaluation of nursery school experience on the later school adjustment of culturally disadvantaged children." U.S. Children's Bureau. *Research relating to children, Bulletin No. 20*, October 1965-May 1966. p 127. (Abstract)

24. Goldstein, Leo S. "Evaluation of an enrichment program for socially disadvantaged children." *Report*. Institute for Developmental Studies. New York Medical College, June 1965.

25. Goodenough, Florence. Measurement of intelligence by drawings. Yonkers, New York, World Book, 1926.

26. Gray, Susan. "An experimental pre-school program for culturally deprived children." Child development, v 36, December 1965. p 887-898.

27. Hellmuth, Jerome, ed. Cognitive studies. Seattle, Washington. Special Child Publications, v 1. (In press)

28. Hess, Robert D. and others. "Techniques for assessing cognitive and social abilities of children and parents in Project Headstart." University of Chicago, 1966. (OEO Contract 519) (ERIC ED 015 772)

29. Hess, Robert D. and Virginia Shipman. "Early experience and the socialization of cognitive modes in children." Child development, v 36, December 1965. p 869-886.

30. Hodges, Walter L. and Howard H. Spicker. "The effects of preschool experience on culturally deprived children." Young children, v 23, October 1967. p 23-43.

31. Hunt, Joseph McVicker. Intelligence and experience. New York, Ronald Press, 1961.

32. Hunt, Joseph McVicker. "The psychological basis for using pre-school enrichment as an antidote for cultural deprivation." Merrill-Palmer quarterly, v 10, n 3, 1964. p 209-248.

33. Josephina, Sister. "An experimental study of the influence of individual vs. group instruction on the spatial abilities in preschool children." Paper presented at the annual meeting, American Educational Research Association, 1968.

34. Kagan, Jerome. "Reflection-impulsivity and reading ability in primary grade children." Child development, v 36, September 1965. p 609-628.

35. Kagan, Jerome, Howard A. Moss and Irving S. Siegel. "Psychological significance of styles of conceptualization." Monographs of the Society for Research in Child Development, v 28, n 2, 1963. p 73-112.

36. Koegler, R.R. "The Montessori classroom; a diagnostic environment." The American Montessori Society bulletin, v 1, n 1, 1965.

37. Kohlberg, Lawrence. "Some research on the Montessori approach to work with culturally disadvantaged children." (In Conference on Pre-School Education, Chicago, 1966. Early education, edited by Robert D. Hess and Roberta Meyer Bear. Chicago, Aldine Pub. Co., 1968.)

38. Lucco, Alfred A. "Curiosity behavior and independent functioning in preschool children." Paper delivered at the 75th annual convention of the American Psychological Association, 1967.

39. Montessori, Maria. The Montessori method, New York, Schocken Books, 1964.

40. Montessori, Maria. Spontaneous activity in education. New York, F.A. Stokes, 1917. (Reprinted 1965, Robert Bentley, Inc., Cambridge, Mass. and Schocken Books, New York.)

41. Morra, Mike. "The Montessori method in the light of contemporary views of learning and motivation." The American Montessori Society bulletin, v 5, n 3, 1967. p 1-7.

42. Naumann, T.F. and B.N. Parsons. "A creative learning environment for normal and handicapped pupils." The American Montessori Society bulletin, v 3, n 2, 1965.

43. Piaget, Jean. The psychology of intelligence. London, Routledge, Kegan and Paul, 1960.

44. Rambusch, Nancy M. Learning how to learn, Baltimore, Helicon Press, 1962.

45. Reichard, Suzanne, Marion Schneider, and David Rapaport. "The development of concept formation in children." American journal of orthopsychiatry, v 14, January 1944. p 156-161.

46. Ricciuti, Henry N. and J. Benjamin. "Sorting behavior and conceptual thinking in pre-school children." Paper delivered at the 65th annual convention of the American Psychological Association, 1957.

47. Salter, Ruth and Louis T. Di Lorenzo. "Pre-kindergarten programs for educationally disadvantaged children: third year evaluation and follow-up." Paper presented at the annual meeting, American Educational Research Association, 1969.

48. Sears, Pauline S. The effect of classroom conditions on the strength of achievement motive and work output on elementary school children. (Cooperative Research Project 873.) Washington, U.S. Office of Education, 1963.

49. Sigel, Irving E. "Developmental trends in the abstraction ability of children." Child development, v 24, 1953. p 131-144.

50. Stodolsky, Susan S. and Gerald Lesser. "Learning patterns in the disadvantaged." Harvard educational review, v 37, 1967. p 546-593.

51. Witkin, Herman A. and others. Psychological differentiation, New York, Wiley, 1962.

52. Witkin, Herman A., Hanna F. Faterson, Donald R. Goodenough, and Judith Birnbaum. "Cognitive patterning in mildly retarded boys." Child development, v 37, June 1966. p 301-316.

53. Wolff, Max and Annie Stein. "Six months later: a comparison of children who had Headstart, Summer 1965, with their classmates in kindergarten." Unpublished manuscript, Yeshiva University, New York, 1966.

54. Yando, Regina M. and Jerome Kagan. "The effect of teacher tempo on the child." Child development, v 39, March 1968. p 27-34.